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THERAPEUTICS

OF THE

GASTRO-INTESTINAL TRACT

THERAPEUTICS

OF THE

GASTRO-INTESTINAL TRACT

BY

DR. CARL WEGELE

ADAPTED AND EDITED, WITH ADDITIONS ON THE DIAGNOSIS OF THE DISEASES OF THE ESOPHAGUS; DIAGNOSIS OF THE DISEASES OF THE GASTRO-INTESTINAL TRACT; DUODENAL TUBE AND ITS USES; DISEASES OF THE PANCREAS, AND X-RAY EXAMINATIONS OF THE GASTRO-INTESTINAL TRACT

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Preface

Dr. Gross and Dr. Held have undertaken the task of fathering an American edition of my book "Therapie der Magen und Darm Erkrankungen."

I here take occasion to thank them for their work and hope that their efforts will meet with the approval of the English-speaking medical profession. Inasmuch as they have not confined themselves to a translation only, but by abbreviating some parts and making valuable additions in others, particularly to diagnosis, they have endeavored to add to the value of the original book.

DR. C. WEGELE.

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Editors' Preface

Before submitting Dr. Wegele's book to the English-speaking public, the Editors wish to say a few words by way of preface.

They decided upon editing this book because they found it a specially conscientious and thorough treatise upon the "Therapy of Stomach and Intestinal Diseases"; because it comprises, in short systematic arrangement, many important facts which are scattered in specialized works too exhaustive for the busy practitioner; because, rightly according to the Editors' views, it lays main stress upon and consistently carries out the dietetic, physical and hygienic treatment of gastro-intestinal diseases.

However, in order to present the subject in a more complete form, the Editors deem it necessary to make extensive additions to the German work. Thus, they state precise points of diagnostic interest in connection with each gastro-intestinal disease; they have added a separate chapter on the esophagus; also a chapter on the X-ray diagnosis of stomach and intestinal diseases—a method to-day indispensable—and here they have depended in great part upon their own clinical experiences. Moreover, they have added, also on the basis of their own researches, a chapter upon the comparatively new subject of the "Duodenal Tube." In connection with this they have an important chapter on the diagnosis and treatment of diseases of the Pancreas, besides minor chapters such as Parasitic Diseases and Diseases of the Intestinal Blood-vessels.

It is hoped that in this more complete form the book will be found useful to those engaged in general practice.

The literature upon the subject has been considered up to the time of going to press.

M. H. Gross and I. W. Held.

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CHAPTER I

General Diagnosis

In the diagnosis of the gastro-intestinal tract, our aim should first be to take a general history, and the physical diagnosis should be directed as carefully to the entire system as to the gastro-intestinal tract. Having completed the general history, we begin to confine ourselves to the history of the digestive organs.

Anamnesis—Age of the Patient.—This is important, because certain diseases of the gastro-intestinal tract are common in certain periods of life. Nervous dyspepsia is frequent at puberty and menopause; ulcus ventriculi in early adult life; carcinoma ventriculi in middle and advanced age.

Occupation is a Factor.—Travellers, for instance, eat at irregular hours and all kinds of food; they suffer frequently from gastro-intestinal catarrh. Persons of great responsibility, who perform excessive work, are inclined to have gastro-intestinal disturbances. Painters suffer from spastic conditions of the intestines.

Habits (smoking, irregular life, excesses in Baccho and Venere, coffee and tea) will often give rise to gastro-intestinal disturbances.

Nationality.—Whether patient lived in tropical countries where parasitic disease exists, or in malarial districts.

Family History.—Tuberculosis, carcinoma, metabolic diseases.

Past History.—Acute infectious disease, venereal diseases; complaints pointing to heart, liver or kidneys.

Now we begin questioning patient in regard to the present ailment, with special attention to the gastro-intestinal tract; when and how the disease started, whether it was associated with temperature, how long did the acute symptoms last, and what the symptoms chiefly consisted of.

Present History.—Appetite—diminished, entirely absent, capricious, excessive; whether patient feels satisfied after meals;

whether hunger is a painful sensation; whether patient is afraid to eat because of the pain it causes.

Thirst.—Excessive, no thirst at all.

Taste.—On empty stomach and after meals; odor from mouth.

Meals.—Time of taking the meals, quality, quantity, quick or slow eater; whether certain articles of food give more disturbances than others.

Inquire about difficulty in deglutition and, if present, whether such exists with solids or liquids or both, and whether persistent or changeable. Sensation in the epigastrium; fulness after meals or real pains and their character; occurrence of pain—whether on an empty stomach (neurasthenia sexualis, masturbation, prostata), how long after meals, and whether pain is relieved by taking of food or vomiting; whether pain is relieved or increased by pressure.

Belching and regurgitation, its taste and odor; dependent or independent on meals. Nausea, vomiting: when, dependent or independent on food; if vomiting occurs, how soon after meals; nature of vomitus: food alone, or bile, or mixed with mucus or blood; does the vomitus consist of food taken a day before; or of mucus alone.

Stools.—Constipation, diarrhea, or both interchangeable; consistency, odor, color, mucus, blood, worms; mucous discharges without stools; whether nausea, pain before or after stools. In cases of diarrhea we inquire of its frequency; whether associated with cramps and tenesmus; distention of the abdomen, borborygmus, peristaltic unrest or the feeling of a foreign body.

Weight.—Loss, and in the course of what time. We inquire what influence the gastro-intestinal conditions had upon the general system.

Physical Examination

GENERAL EXAMINATION

Appearance: We note habitus (asthenicus or apoplecticus). Glands are examined. Eyes: sclera (jaundice), action and size of pupils observed. Superficial and deep reflexes tested: chest, heart and lungs carefully examined; sensory disturbances noted.

Abdomen: liver, spleen. Urine examination.

SPECIAL EXAMINATION

Inspection.—Tongue, coated or clean, dry, moist, or cracked. Mouth, teeth, pharynx.

Abdomen: size, configuration, meteorism, or retraction, distention; uniform or localized; protrusion of umbilicus; visible hernias (epigastric, umbilical, inguinal, femoral); visible peristalsis and its localization; stiffening of the stomach. Distended veins, discoloration.

Palpation.—The success of palpation depends upon tonicity tension of the abdominal wall, degree of muscle and fat. By palpation we try to determine the pyloric part, also the greater curvature, tumors, where they belong, their shape, size, consistency, sensitiveness, and other painful areas in the region of the stomach. Painful pressure points in the epigastrium or localized resistance, and, above all, hyperesthesia of the skin.

Method of Palpation.—Patient flat on his back, relaxed, told to breathe naturally, his attention distracted, palpating hands warm, talcum powder or vaseline on the skin sometimes renders palpation easier.

We first begin with *superficial palpation* to determine abnormalities nearest to the skin, such as epigastric hernias, tumors, fibromas of the skin. By this method we are also able to outline deeper organs, such as enlarged liver, distended cecum, etc.

Deep Palpation.—Starting in left hypochondrium, going to the right; hand is held steeplike, taking advantage of each expiration of the patient, digging the examining hand deeper until spinal column is reached. By deep palpation we can determine: pylorus, sometimes greater or lesser curvature, deep-seated tumors, mobility of tumor under influence of respiration.

The pylorus is best palpated two fingers above umbilicus in the median line or a little to the left. With palpation we also utilize the tapping of the stomach, eliciting a splashing sound. The latter is brought about easier if the left hand uses pressure below the xyphoid process, while the right hand is tapping the stomach region. Splash-

ing sound even three hours after a heavy meal or one hour after partaking of 300 to 400 gm of fluid in not excessively fat individuals is not pathologic.

Percussion is the least satisfactory of the physical methods of examining the stomach. Light percussion (*Goldscheider*) will give the best results. Auscultatory percussion, which consists in tapping the stomach lightly while listening with the stethoscope is another method of outlining the stomach.

Insufflation of gas: either by bicarbonate of soda and tartaric acid, 1 teaspoonful of each, or by stomach tube, is a method of determining the position, and size of the stomach, and also whether a tumor in that part belongs to the stomach at all or is situated outside of the stomach.

Ulcus ventriculi and acute inflammations contraindicate the insufflation of the stomach.

The outlines of the inflated stomach are made out by inspection and percussion.

Auscultation.—In persons with thin abdominal walls and an atonic, prolapsed stomach, a sound may be heard on deep inspiration. Sometimes a squirting sound is heard below the xyphoid process corresponding to the fluid entering the stomach through the cardia; a similar sound is sometimes heard and felt in the region of the pylorus.

Another method for outlining the stomach is gastrodiaphony (*Einhorn*), usually done on an empty stomach. The patient swallows 300 gm of water; the tube with the electric light attached is introduced in the erect position, the room is darkened and the interior of the stomach lighted up; in thin persons parts of the stomach not covered by the spleen and liver can be seen. The method, while simple, is not exact and can be entirely dispensed with.

A more exact method is the gastroscopic examination. The method is beginning to be more promising, since the improved gastroscope used by *Elsener* has been made known.

Elsener succeeded in demonstrating by this method ulcers and tumors of the stomach.

Another important aid in diagnosis is the X-ray examination, treated in a special chapter of this book.

FUNCTIONAL TESTS OF THE STOMACH

Outside of acute gastritis, functional tests are indispensable for diagnosis and treatment of gastric disorders.

Motility.—To determine the motility of the stomach, we first examine the patient on an empty stomach by the stomach tube, determining whether any macro- or microscopical stagnation exists. Normally, on an empty stomach with good motility, no contents are found, or 5 to 10 cc of gastric juice, neutral or slightly acid, is found. Microscopic: Normally a few leucocytes, epithelial cells and a little mucus.

Tests

In order to still more determine whether there is disturbed motility, we order the patient, a night before examination, to take a meal consisting of soup, meat, potatoes with addition of rice and currants, and if the next morning the stomach is found empty macro- and microscopically, motility is normal.

Other Methods. Ewald's Salol Method.—One gm of salol is given and the urine tested one hour later, adding a few drops of liquor ferri sesquichlor. to 5 cc of urine. A violet color will show that salicylic acid is present; hence the salol had already reached the intestine and broken up into phenol and salicylic acid. Normally, the reaction appears one hour after the salol is taken, showing normal motility of the stomach.

Iodopin Test (Winkler and Fleiner).—One gm of iodopin; in normal motility this should appear in the saliva in forty-five minutes and is demonstrated by soaking starch paper in the saliva. On applying 1 drop of nitric acid, a blue color will appear.

The *Leube* and *Riegel* test-meal to test motility:

Soup	150 gm
Meat	200 gm
Bread	100 gm
Potatoes	100 gm

Normally, there should be no food remnants after six to seven hours.

The *Leube-Riegel* test-meal can also be utilized for determining the secretion of the stomach, but for that purpose the contents should be removed three to four hours after meals.

Pathologically; depending upon the degree of stagnation, there are found food particles, either macro- and microscopically, or only microscopically; also yeast (*a*) cells and myelin (*b*) bodies.

Sarcinæ (*c*) are found in higher degrees of stagnation, particularly in benign stenosis; they appear in one of the two forms either as bales or cuboidal masses.

To bring them out better under the microscope, a drop of the following solution may be put on the specimen:

Zinc chloridi	20.0
Kalii iodidi	6.5
Iodini	1.3
Aquæ	10.0

The sarcinæ will color red-violet, and the yeast fungi appear as oval, transparent, pearl-like bodies.

The small starch (*d*) bodies are colored blue by adding lugol solution. Where lactic acid is present, like in malignant stenosis, the *Boas-Oppler* (*e*) bacilli will be found; they appear fairly long, slightly movable and very often at right angles to each other.

The *Boas-Oppler* bacilli are found not only in cases of carcinoma of the stomach; we also find them in cases of hyperacidity, anacidity or hypoacidity; but if, after repeated lavage of the stomach, they rapidly increase in number, we should think of malignancy.

Further abnormal microscopical findings are infusorii and amœbæ, as well as fat crystals, *f*; neutral fat, *g*; also muscle fibre, *h*; and vegetables, *i*.

Crystals of leucin, tyrosin and cholesterin are sometimes found under pathological conditions.

The quantity of gastric juice normally obtained from an empty stomach is 5 to 10 cc. Quantities of 40 cc and more constitute gastrosuccorrhea. It is in these cases that the microscopic myelin bodies, Fig. 1, *b*, are found. We always find some mucus, *k*, leucocytes, *l*, and epithelium, *m*. They look glossy, are as large as red blood cells and larger, show different forms and look like spirals.

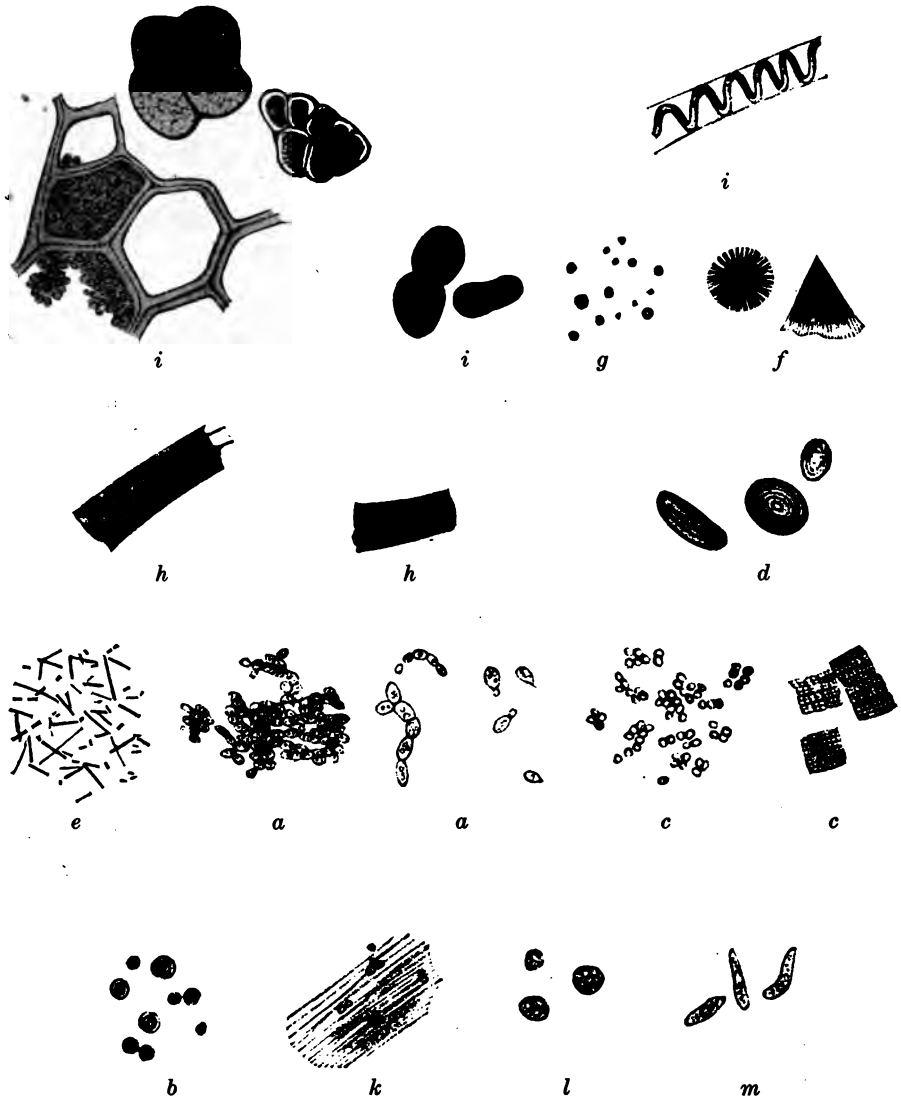

FIG. 1.—Microscopical Findings of the Stomach Contents in a Normal and Abnormal State.

a, yeast cells.
b, myelin bodies.
c, sarcinæ.
d, starch bodies.
e, Boas-Oppler-bacilli.
f, fat crystals.
g, neutral fat.
h, muscle fibre.
i, vegetable rests.
k, mucus with cells.
l, leucocytes.
m, epithelia.

Now *Ewald's* test-breakfast, consisting of 300 gm of non-sweetened weak tea or plain water, and 70 gm of water roll one day old, is given to the patient and removed by the stomach tube three-quarters to one hour later. This is first examined macroscopically.

Normally, a test-breakfast has a homogeneous appearance, and within a few minutes a sediment will settle at the bottom with a cloudy fluid on top. The quantity usually obtained is between 30 and 50 cc. Markedly increased quantities above 50 cc point to slow emptying of the stomach, which may be due either to atony or hyperacidity with pylorospasm, or a mild degree of pyloric stenosis.

A stomach found entirely empty one hour after the test-breakfast speaks for too rapid emptying of the stomach, which, as a rule, is the case in achylia and anacidity due to the open pylorus. There may be nervous hypermotility of the stomach without pathologic changes, also causing rapid emptying of the stomach. Hyperacidity and hypermotility point to duodenal ulcer.

The distribution of the solids and fluids in the obtained contents are normally in equal proportion. If the fluids are in proportion of two-thirds to one-third of solids, there is hypersecretion. If the solids predominate, there is diminished secretion and lowered motility.

Normally, the solids are finely chymified, while in cases of achylia and hypoacidity the solids appear in coarser particles.

A good chymification of the stomach contents after an *Ewald's* test-breakfast speaks for a normal secretion, even in cases of diminished acidity of free HCl or low (15–20) total acidity (*Ehrman*).

A good chymification, with a few coarser particles mixed in, speaks for bad mastication or bad teeth.

A little mucus swimming on the surface of the contents is found even normally. Pathologically, there is an increase of mucus, and mucus intermixed with the food.

Blood must be looked for and its source determined. A little bright-red blood may normally be found due to trauma by the stomach tube. Pathologically, the blood is dark in color and mixed with stomach contents (ulcus, cancer).

Bile and intestinal juice, which are more often found in a normal empty stomach, are sometimes also found with the test-breakfast and give a greenish color to the contents. Frequent finding of bile and regurgitation of intestinal juice may indicate stenosis of the duo-

denum. Occasionally we find the stomach contents rose-red, which is due, according to *Meinel*, to urobilin, in the presence of HCl. In other cases we find the stomach contents colored grass-green, which is due to the change of bilirubin of the regurgitated duodenal contents into biliverdin.

Normally, the gastric contents are odorless. Sour odor indicates starch fermentation, an odor of hydrogen sulphite (H_2S) nitrogen decomposition.

Chemical Examination

The contents are filtered. Usually 20 cc of the filtered stomach contents are needed, but smaller quantities will also suffice.

Obligatory and indispensable for the general practitioner is the determination of free and total acidity, while the ferments and the digestion of starches are of less importance.

We first test for the reaction of the contents with blue litmus paper, which normally turns red, showing the presence of acids. We then test with congo paper which normally turns blue, indicating the presence of free hydrochloric acid: the deeper the blue, the higher the acidity. Dark gray color of the congo paper speaks for organic acids (lactic acid).

If congo turns blue, the *Guensburg* reaction can usually be dispensed with, although a finer test for free HCl is that by means of the *Guensburg* reagent:

Vanilin	1.0
Phloroglucin	2.0
Alcohol absol.	30.0

Two drops of the filtered gastric contents and two drops of the reagent are slowly heated in a porcelain dish. If free HCl is present, a cherry-red color will result.

As the *Guensburg* solution becomes easily decomposed, *Boas* advised a more stable solution:

Resorcin	5.1
Sacchari albi	3.0
Spir. dilut.	100.0

Proceeding in the same manner, the same color reaction will be obtained as with the *Guensburg* method.

QUANTITATIVE ESTIMATION

Acids

For determining the free acidity, 1 to 2 drops of a ½% alcoholic solution of dymethylamidoazobenzol (*Toepfer's* solution) are added to 10 cc of filtered gastric contents, as an indicator. From a burette containing ⅒ normal NaOH (sodium hydroxid) a sufficient quantity is added drop by drop, until the red color disappears. We now read off the number of cc of sodium hydroxid used and multiply by 10, which will indicate the quantity of free acid.

If, for instance, 2.4 of the ⅒ normal NaOH were used up to decolorize the gastric contents, multiplication of 2.4 by 10 would give the result of 24 free acid.

To determine the total acidity, add 1 to 2 drops of a 1% alcoholic solution of phenolphthalein to 10 cc of filtered contents; this is titrated with ⅒ normal NaOH, until the red color disappears; the cc used are read off and multiplied by 10, which will give the total acidity.

EXAMPLE.—5.6: cc NaOH used; multiplied by 10 is equal to 56 total acidity.

The same 10 cc of filtered contents can be used for determining both, free and total acidity.

Add 1 drop of *Toepfer's* solution and titrate with ⅒ normal NaOH, until the red color disappears; read off and multiply by 10; result obtained indicates free acid. Add a drop of the phenolphthalein solution and add of the ⅒ normal NaOH solution enough to make the red color reappear; read off again and multiply by 10 the entire quantity of cc of the ⅒ normal solution used up, and we obtain the total acidity.

A simpler method is *Riegel's:* Ten cc of gastric juice are titrated with a ⅒ normal NaOH. The presence of free HCl is tested by means of a glass rod dipped into the gastric juice and dropped on congo paper until the blue color disappears. Read off the number of cc of the decinormal solution used up, multiply by 10, and the result indicates the quantity of free acid present. Then add 2 drops of the phenolphthalein solution to the gastric juice and again titrate

with sodium hydroxid until red color comes up. Read off the whole quantity of the $\frac{1}{10}$ normal solution used up and multiply by 10, which gives the total acidity.

If we have only 5 cc of gastric juice, we multiply the number of cc of $\frac{1}{10}$ normal NaOH by 20.

To determine combined acids, a 1% aqueous solution of alizarin is used as an indicator. One drop of that solution is added to 10 cc of gastric juice and titrated with $\frac{1}{10}$ normal NaOH until the yellow color becomes violet; the number of cc required is then multiplied by 10.

For practical purposes we may eliminate the examination for combined acids.

To determine the percentage of free HCl, we proceed as follows: One cc of $\frac{1}{10}$ normal NaOH neutralizes 1 cc of $\frac{1}{10}$ normal HCl. The atomic weight of HCl is *36.5;* therefore 1 litre of normal HCl equals 36.5 grams of HCl, and 1 cc of the normal equals 0.0365 HCl, and 1 cc of $\frac{1}{10}$ normal equals 0.00365. We therefore multiply 0.00365 by the total acidity.

Example: Total acidity 50, multiplied by 0.00365, is equal to 0.01825%.

The number 365 is best remembered by the number of days in the year, preceded by as many naughts as there are numbers, or 0.00365.

Organic Acids.—When free HCl is present, there is no need to look for organic acids. The organic acids to be looked for are, lactic, acetic and butyric acids.

Test for Lactic Acid.—Three to five drops of liquor ferri sesquichlorati are added to 20 to 30 cc of water. The reagent is put into two test-tubes for comparison. To one of the test-tubes filtered gastric juice is added drop by drop, and in the presence of lactic acid the solution will turn amber yellow. The change of color is best seen when both test-tubes are compared.

Strauss Test.—Five cc of filtered gastric contents are shaken with 20 cc of alcohol-free ether; the ether is then poured off and diluted with an equal quantity of water; after which 2 drops of 1 : 9 solution of liquor ferri sesquichlorati are added and the mix-

ture thoroughly shaken. If lactic acid is present, an intense green color will result.

The *Uffelman* test for lactic acid: To 20 cc of a 1% carbolic acid solution, we add 1 drop of dilute ferri chloridi. We then add to this solution the filtered stomach contents drop by drop; canary-yellow color indicates the presence of lactic acid.

Test for Fatty Acids.—Ten cc of filtered gastric contents are treated with 1 gm of sodium sulphate and shaken twice or three times. Add 50 cc of ether. The ether is poured off. The fluid remnant is acid in reaction and has a characteristic odor. Divide into two portions: one to be tested for acetic acid and the other for butyric acid.

Test for Acetic Acid.—Dilute solution with water, neutralize with diluted sodium and add 1 drop of liquor ferri sesquichlor. The solution colors first blue, then red, and on boiling yields a brown-red sediment.

Test for Butyric Acid.—Add to the solution 2 to 3 cc of water and a small piece of calcium chloride: the butyric acid will at once rise to the surface and is recognized by its characteristic odor.

Ferments

Tests for Pepsin—Mett's Test.—Filter egg albumen through gauze into a glass, into which glass tubes 2 mm in diameter and a little longer than the depth of the albumen are dipped. The glass is heated in a water-bath for five to ten minutes, removed and allowed to cool slowly; break the glass, cut out carefully the tubes filled with albumen and keep them in glycerin for future use. One tube is used for each test in the following manner. The tube is first washed and then put into 10 cc of filtered gastric contents and placed in an incubator for a few hours at a temperature of 100° F. Should free HCl be absent, add to the gastric contents 1 to 2 drops of diluted HCl. If after a few hours part of the tube contents is found digested, we know that pepsin is present. The degree of digestion in the tube indicates the quantity of pepsin.

The Volhard and Gross Method.—To casein is added 5 cc of gastric juice and left in an incubator for 10 to 12 hours at 100° F. If this is found digested, we know that pepsin is present.

Another test is that of *Jacoby*, which is also a quantitative estimation. It is based upon the fact that a castor-oil solution, made cloudy by HCl, is cleared by pepsin.

First Solution: 1% olei ricini in 5% sod. chlorid. Second Solution: Normal HCl.

Test: Into eight test-tubes of the same calibre pour 1 cc of Solution 1 plus 0.5 of $\frac{1}{10}$ normal HCl.

Tubes 1 and 8 serve as controls, while to tubes 2 to 7 different dilutions of gastric contents are added as follows:

Tube 2—	Gastric	juice	.....	1:1000
" 3—	"	"	.....	1: 500
" 4—	"	"	.....	1: 200
" 5—	"	"	.....	1: 100
" 6—	"	"	.....	1: 50
" 7—	"	"	.....	1: 20

To tubes 1 and 8 distilled water is added. All the test-tubes are left in the incubator for 3 hours at 100° F. and then removed to see which dilution was sufficient to clear up the cloudiness. If the 1 : 100 solution clears the cloudiness within 3 hours, we speak of normal pepsin digestion.

The *edestin test of Fulde* is based on the same principle, except that the 1% oleum ricini is replaced by a 1% edestin solution. To this is added a solution of $\frac{1}{10}$ normal HCl and made cloudy by a sodium chloride solution.

Test: Into each of six test-tubes are put 2 cc of the edestin solution and small quantities of 10 to 20 cc diluted gastric juice, in the following manner:

Tube 1	to contain	0.1	of the	diluted	gastric juice
" 2	"	0.16	"	"	"
" 3	"	0.25	"	"	"
" 4	"	0.4	"	"	"
" 5	"	0.64	"	"	"
" 6	"	1.0	"	"	"

Let stand for one-half hour at room temperature and add 6 drops of a concentrated sodium chloride solution. Let again stand at room temperature. When the solutions are entirely clear, the digestion is complete.

Another very simple method for determining the presence of pepsin is *L. Bourget's* method: Take 10 ccm of filtered stomach contents, put in a small flat tightly corked bottle, in which a small piece of egg albumen is placed. Then put the bottle into double boiler at 105° for one-half hour or fasten the bottle inside of your belt for an hour or two (blood temperature). If pepsin is present, the egg albumen will be found partially or entirely digested.

We know that whenever HCl is present, pepsin is also present, and in such cases we can dispense with the test for pepsin.

Rennin Test.—To 5 cc of gastric juice plus 0.5% of sodium hydroxid add boiled milk of neutral reaction. Put into incubator at 100° F. for 10 to 20 minutes. If rennin is present, there will be coagulation and formation of casein.

Test for Ren-zymogen.—It is only necessary when rennin is absent. To the milk 10 ccm of gastric juice is added, and a few drops of 1% calcium chlorate solution, and in the presence of renzymogen we get coagulation.

The stomach also possesses a fat-splitting ferment, lipase, demonstrated by *Volard* and experimentally shown by *Pawlow* who excluded intestinal regurgitation and demonstrated that the gastric juice digested yolk of egg.

The degree of starch digestion can be demonstrated by chemical examination. Starch is first split by ptyalin of the saliva, the first product being amyludin, and turning blue in the presence of iodine. Then comes erythrodextrin, turning red with iodine, and achroodextrin which gives no color with iodine. The last one is finally converted into malt sugar which reduces copper oxid; the final result is its conversion into dextrose. The digestion of the starch shell depends to a certain degree upon the acidity of the stomach.

When 0.02% acidity is reached in the stomach, ptyalin action is discontinued. From a diagnostic standpoint it is important that in hyperacidity starch digestion is impaired, as we find its conversion incomplete. The reverse is true in sub- and anacidity.

Blood in Gastric Contents; Chemical Test.—In order to attribute diagnostic value to the chemical test of blood, all possible sources of error, such as trauma caused by the stomach tube, varicose veins of

the esophagus, blood from nose, pharynx, teeth, lungs, or from having eaten raw beef, must be excluded.

Guaiac Test.—To 5 cc of gastric contents is added 2 cc of glacial acetic acid and shaken with an equal quantity of ether. Pour off the ether, and add to the ether a few drops of old French turpentine or hydrogen peroxid, and then a few drops of a freshly prepared alcoholic solution of guaiac. If blood is present, the solution turns blue-violet.

The alcoholic guaiac solution should be brown-yellow, and not dark brown.

Aloin Test.—The test is carried out in the same manner as the guaiac test, except that a freshly prepared aloin alcoholic solution is used instead of guaiac. If blood is present, a strawberry-red color will result.

Benzidin Test.—Put about 0.5 of benzidin with 1 cc of glacial acetic acid and 2 cc of H_2O_2 into one test-tube. In a second test-tube a few cc of filtered gastric contents are boiled. Now we float the solution of the first test-tube on that of the second. In the presence of blood a green-blue color will appear.

Spectroscopic Test.—For this test treat gastric contents with concentrated acetic acid and shake with ether. The gastric contents will turn red-brown, and under the spectroscope the hydrochloric acid hematin shows four absorption stripes: red, yellow, boundary of yellow and green and boundary between green and blue.

Hydrogen Sulphite (H_2S) is readily recognized by the characteristic odor or chemically by the following method:

A piece of paper is saturated with an alkaline solution of sugar of lead and a drop of gastric juice is put upon it. In the presence of H_2S the spot turns black, which indicates decomposition.

Bile Test; Gmelin's Test.—Five cc concentrated nitric acid and an equal quantity of the yellow fuming nitric acid are added to the gastric juice: where the solution comes in contact, there is display of green, blue and violet colors.

Microscopic Examination of Ewald's Test-Breakfast.—Normally starch granules, yeast cells, pavement epithelium and some mucus is found.

For diagnostic purposes microscopical examination of the empty stomach contents in fasting condition is important, which is fully described on p. 5.

Here we can only add that under abnormal circumstances the gastric juice from an empty stomach may show leucin, tyrosin, triple phosphates, phosphates of magnesia and cholesterin plates; such findings show high degrees of decomposition.

Where the use of the stomach tube is contraindicated, the *Sahli* dermoid capsule can be used to determine the secretory function of the stomach. A small rubber bag, filled with methylene blue and tightened with catgut, is swallowed. In normal digestion the catgut is digested, the bag opens and methylene blue appears in the urine within ten hours.

For the same purpose *A. Schmidt* orders an intestinal test diet (see p. 183). If connective tissue is found in the stools, the secretion of HCl is disturbed.

To determine the presence of free HCl without the use of the stomach tube, we give the patient ½ teaspoonful of bicarbonate of soda ($NaHCO_3$); in the presence of free HCl carbondioxide (CO_2) is given off, causing a noise which can be heard by auscultating the stomach.

Another method for determining free HCl in the stomach contents, without the use of the sound, has been devised by *Friedrich.*[1] The method consists in producing the necessary chemical reaction in the stomach by means of threads saturated with Congo red. A small metal cylinder enclosed in a capsule is attached to a long thread dyed with Congo red, another short thread dyed pink; the short thread is attached to the cylinder and enclosed within the capsule; this capsule, with the metal cylinder, is swallowed by the patient 20 minutes after *Ewald's* test-breakfast. Half an hour later it is withdrawn by means of the long thread. According to the reaction of the thread depends the amount of free hydrochloric acid. Browning of the dark red thread indicates subnormal acid; violet, normal; blue-black, above

[1] Berlin. Klin. Wochenschrift, No. 32, 1912.

normal. The smaller thread, which is pink, colors blue in hyperchlorhydria.

IMPORTANCE OF THE EXAMINATION OF THE BLOOD IN GASTRO-INTESTINAL DISEASES

The studies made in blood changes have not led to any definite conclusions.

The changes in the blood as a result of carcinoma are secondary. The same is also true of anemia resulting from ulcer of the stomach. The association of pernicious anemia with intestinal intoxication, as pointed out by *Grawitz* and confirmed by the therapeutic test, like washing of the stomach, colonic irrigations and lacto-vegetable diet, leads one to believe that the stomach changes have a direct influence upon the blood.

Increase of eosinophilia should always lead one to suspect parasitic disease. Increase in the basophile cells is a result of lead poisoning and a common feature in intestinal diseases.

IMPORTANCE OF URINE EXAMINATION IN GASTRO-INTESTINAL DISEASES

The presence of sugar or albumen in the urine will very often show that the gastro-intestinal symptoms are secondary. A number of authors, *Ury, Aldor, Chvostek,* have demonstrated the presence of albumose in the urine in carcinoma of the stomach and in gallstones.

Salomon and *Saxl* noticed an increase in oxyprotein acid in the urine in cases of carcinoma.

Acetone is found in the urine in cases of inanition. Indican and indolacetic acid are found in the urine in cases of intestinal putrefaction. The importance of pepsin in the urine was first pointed out by *Brünning* and *Friedberger* in carcinoma of the stomach and diminished gastric secretion. *Wilenko* compared the total quantity of pepsin in 24 hours' urine with that of the stomach and he found at times that there was an inverse proportion of quantity of pepsin between stomach and urine. His conclusion was that, while the gastric mucosa had lost its property of producing enough pepsin for the stomach, it still produced enough to provide for the tissue. *Ellinger*

concluded from his findings that the peptic ferment of the urine originates from a pro-pepsin formed by the stomach and, entering the blood, is there converted into pepsin.

Ellinger found in his examination of gastric diseases that, in achylia, pepsin is absent in the stomach as well as in the urine, while in carcinoma of the stomach the quantity of gastric pepsin is reduced and that in the urine much increased.

Biological Methods

DIAGNOSIS FOR CARCINOMA OF THE STOMACH

Of late, studies have been directed to the specific changes that take place in the organism owing to malignant growths. Although they have not yielded any practical results as yet, we deem it well to outline the most important work in that line. The reactions are based upon (1) the peptid-splitting property of the carcinomatous gastric contents; (2) the existence of a hemolytic property of the carcinomatous gastric juice; (3) precipitin and complement binding property; (4) anaphylactic action of the gastric juice.

THE PEPTID-SPLITTING ACTION OF CARCINOMATOUS GASTRIC CONTENTS

Emerson has shown that carcinomatous gastric contents possess a ferment that has the property of converting albumen into substances of the above-mentioned albumose group.

H. Fischer has shown that in carcinomatous gastric contents the end products of albumen are found, such as tyrosin, leucin and lysin. *Neubauer* and *Fischer* also demonstrated the splitting property of peptids by the carcinomatous gastric contents.

Upon these ferments in carcinoma of the stomach is based the so-called glycyl-tryptophan test, which is carried out as follows:

The patient receives a test-breakfast which is withdrawn in one-half to three-quarters of an hour, filtered and examined for blood and bile. To 10 cc of the filtered gastric contents some glycyl-tryptophan and toluol are added. The contents are placed in an incubator for 24 hours. After that time 2 or 3 cc are removed by

a pipette from just below the toluol and put into another test-tube; to this are added a few drops of a 3% acetic acid solution and the entire contents are treated with bromine fumes. If the solution changes into a rose red, the reaction is positive.

A simplified method is used by *Weinstein*, as follows:

Patient receives a glass of milk and a roll, which is removed in one hour. The contents are filtered; 10% of the filtrate are treated with 2 or 3 drops of a 3% acetic acid solution and we now add 2 or 3 drops of a saturated watery solution of bromine. Rose color indicates a positive reaction. If rose color does not appear at once, the solution is allowed to stand for a few minutes, after which another few drops of the bromine solution are added. Conditions other than cancer that are apt to give a positive reaction are lactic acid, yeast fungi, blood, pancreatic juice, bile.

Most authors, such as *Schmidt*, *Kuttner*, consider the test absolutely useless, while *Weinstein* lays great stress upon its value in cancer of the stomach. We had occasion to apply it repeatedly and have found its diagnostic value to be extremely doubtful.

TEST FOR HEMOLYSIS OF GASTRIC CONTENTS

is based upon *Metschnikoff's* discovery of substances that have a hemolytic action on organic extracts. *Gräfe* and *Römer*, in utilizing such examinations for gastric contents, found that the ether extract of gastric contents of an alkaline reaction, especially of a carcinomatous stomach, contains hemolytic substances. They attribute this property to the fatty acids that are the products of carcinomatous tissue. Here, too, the objection to the value of the test lies in the fact that regurgitation of intestinal contents into the stomach may be responsible for the reaction.

PRECIPITIN AND COMPLEMENT BINDING REACTION OF THE GASTRIC CONTENTS

Maragliano washed out the fasting carcinomatous stomach, and inoculated animals with some of the return water in order to see whether the albumen of the wash-water would give a precipitate with the serum. The experiments were not successful, because the washed-

out normal stomach also yielded a precipitate with the serum of an inoculated animal. As the wash-water of a carcinomatous stomach contains elements from the broken up mucosa and the specific carcinomatous tissue, aside from the albumin of the blood serum, *Maragliano* concluded that the serum of the inoculated animals must contain different specific precipitins. He took normal human blood serum, stomach contents rich in epithelial cells and secretions from a tumor surface; this mixture was brought into contact with the serum of an inoculated animal, and there was a precipitate. Decanting the precipitate, he received a liquid which always precipitated with the water obtained from the washed out carcinomatous stomach.

Livierato succeeded in demonstrating in the gastric juice of a carcinomatous stomach, substances possessing the property of complement binding. He employs the following method:

Carcinomatous gastric juice is filtered under aseptic precautions, neutralized with a 10% aseptic solution of sodium hydroxid, kept for one hour at 60° F. and then put on ice. The tumor extract is treated with normal physiologic salt solution, rubbed up thoroughly, treated with a few drops of chloroform, kept for 24 hours in the incubator, filtered, put into sterile tubes and kept on ice.

Test.—Alexine (guinea-pig), $\frac{1}{10}$ cc, gastric juice 1 to $1\frac{1}{2}$ cc, tumor extract, $1\frac{1}{2}$ cc, hemolytic mixture, 1 cc ($\frac{2}{10}$ hemolytic serum of a rabbit at 56°), and $\frac{8}{10}$ of a solution of washed red blood corpuscles of a bull, in 19 cc of a sterile physiologic salt solution. Now put in succession alexine, gastric juice, neoplasm extract, into test-tubes, and shake. Leave tubes standing at room temperature for 24 hours, then add the hemolytic mixture to each tube. In from 5 to 6 hours the reaction is complete and persists for 24 hours.

Livierato also attributes anaphylactic action to carcinomatous tissue. When he injected 0.1 cc carcinomatous gastric juice subdurally into an animal, anaphylaxis with fatal end resulted. But when he injected even 1 cc of normal gastric juice, no anaphylactic symptoms set in.

Salomon's Test.—Patient's empty stomach is washed out 2 to 3 times. The last wash, looking all clear, is tested for albumin by boiling with a few drops of dilute acetic acid. In the presence of cloudiness the test is positive.

CHAPTER II

General Treatment

General Diet in Gastro-Intestinal Diseases

INTRODUCTION

> "To prescribe an easily digestible diet is of no value whatever, unless the physician thoroughly understands and clearly explains to the patient what an easily digestible diet means."
> —*Von Leube* (Zeitschrift für klinische Medizin, Vol. VI, 1883).

A truly rational way of diagnosing and treating the diseases of the gastro-intestinal tract, together with a correct understanding of the functional disturbances of the digestive organs dates back to the introduction of the stomach tube by *Kussmaul* in 1867. Its full therapeutic value, however, was not recognized until, in 1875, *Oser* conceived the idea of using a soft tube, by which it became possible to examine and determine the secretion and motility of the stomach. Every physician knows to what extent our knowledge of gastro-intestinal diseases was aided through the painstaking clinical researches of *von Leube*, *Riegel*, *Oser*, *Ewald*, *Boas*, *Rosenheim*, *H. Strauss*, *von Mehring*, and others, and by the fundamental physiological experiments on dogs by *Pawlow* and his pupils. It is mainly due to the achievements of the above mentioned authors that we are to-day able to diagnose and rationally prescribe for gastro-intestinal affections.

An empirical diet for these cases has already been mentioned by *Hippocrates*, but it was only in the latter part of the last century that a true foundation was laid in this respect by *Liebig*, *Bischoff*, *Voit*, and *Pettenkofer*, and followed by the analytical examinations of *König*, *Renk*, *Stutzer*, *Lehmann*, and others. More recently, scientific cooking began to be taken up by physicians (*Moritz*, *Jürgensen*), who advocated special courses. It seems particularly of importance that

women, and especially nurses, should be properly instructed in this respect as part of their training.

GENERAL RULES OF DIET

It is not the object of this work to dwell extensively on the prophylaxis of gastro-intestinal diseases, but a few words seem to us essential. To be efficient, prophylaxis should be commenced in infancy, and it cannot be too strongly emphasized that breast-fed children have a far more resistant gastro-intestinal tract than those artificially fed. For children in the adolescent age, fresh air, exercise, rational feeding without overloading the stomach, avoidance of excessive school work, are points of importance. On the other hand, the juvenile gastro-intestinal tract should not be rendered too sensitive by diet too easy of digestion.

In the adolescent period attention should also be paid to sexual hygiene, as masturbation at that age often leads to serious reflex disturbances of the gastro-intestinal canal.

Tongue, teeth and gums should be kept scrupulously clean, the oral cavity rinsed with an antiseptic mouth wash after each meal; carious teeth should be attended to.

It is important from a prophylactic as well as a therapeutic point of view to eat slowly, and thoroughly masticate the food. Thorough mastication facilitates the work of the stomach, and allows the food to remain longer in contact with the saliva which contains a ferment (ptyalin) that changes starch into dextrin and maltose.

That psychical impressions influence digestion, is evidenced by the fact that eating in anger, fear or emotion is often followed by gastric disturbances, such as pressure in the epigastric region or even vomiting; while eating under pleasant surroundings, even a weak stomach will digest food of a poorly digestible nature.

Meals should be taken at regular intervals, and experience has shown that, as a rule, three meals a day are most conducive to good digestion.

For women it is advisable to divest themselves of their corsets during and shortly after meals.

Extreme temperature of the food is detrimental to the gastric mucosa, the most suitable being blood temperature. *Quincke* has

shown that the temperature of the stomach after drinking a glass of cold water, remains lower than normal for half an hour.

Weil gives the following temperatures as the most suitable:

Drinking-water	54° F.
Beer	59° F.
Light white wine	59° F.
Strong white wine	50° F.
Red wine	65° F.

while *Mendelsohn* gives the following figures:

Milk	77° to 95° F.
Bouillon	98° to 113° F.
Coffee	104° F.
Gruel	98° to 107° F.
Roast meat	about 122° F.

Champagne should not be taken frappé, and beverages generally should not be taken in large quantities with meals.

Opinions differ as to the advisability of taking a short nap after meals; while *von Leube* and *Kunze* recommend yielding to the tired feeling due to a diminished blood-supply of the brain, *Boas* distinctly advises a short walk after meals, particularly for persons suffering from nervous dyspepsia. Our own opinion is that patients should be guided by their age, habits and inclination. A prolonged deep sleep after heavy meals is certainly injurious to most people, especially in the presence of nervous dyspepsia, while a short nap after the principal meal, preferably in a cold or well-ventilated room, is beneficial to most people.

Full consideration will be given in the proper chapters to the question of rest after meals on the part of patients suffering from organic disease of the gastro-intestinal tract.

Late suppers, or meals taken shortly before retiring, interfere with restful sleep.

Sound sleep for seven to eight hours is essential for good digestion.

Smoking on an empty stomach is harmful, while a light cigar after meals will produce no ill-effect on the normal digestive tract. Chewing of tobacco is also harmful, especially if part of the juice is swallowed.

The influence of menstruation and pregnancy on digestion is, as

a rule, a slight one; should, however, digestion be disturbed during these periods, the condition should be met by a corresponding diet.

It is very important, from a prophylactic standpoint, that the bowels should move regularly. In childhood and early youth, means should be adopted to overcome any tendency to constipation by physical exercise, such as rowing, bicycle riding, swimming, skating, tennis, or, when such active exercises are contraindicated, by milder procedures, such as light walking, indoor gymnastics or massage, so as to strengthen the abdominal muscles.

The Diet

What diet meets best the demand for light digestion? This question has been the subject of considerable discussion, and even at the present time the views of authors still vary.

The first real observation of how digestion is going on in the stomach was made by *Beaumont* [1] on the famous Canadian, St. Martin, who was accidentally shot in the stomach and lived with a gastric fistula. *Beaumont* was able to follow exactly the process of digestion in the stomach with different articles of nutrition and the length of time the stomach required to dispose of the various foods.

Richet [2] also had an opportunity to observe stomach digestion in a patient on whom gastrostomy was performed for stricture of the esophagus.

The attempt to form a judgment of the digestibility of food from the sensation it produces in the stomach instead of by the solubility of the food in the stomach, is a frequent mistake. According to the latest researches of *Pawlow* [3] and *Moritz*,[4] the stomach is mainly a preparatory organ for dissolving the food by chemical and physical means and reducing it to small particles, while the actual digestive process, preparing the food for absorption, is carried on by the small intestine. The absorption of food directly from the stomach is minimal.

It has already been mentioned that after the action of saliva

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[1] Experiments and Observations on the Gastric Juice, Edinburgh, 1838.
[2] Du suc gastrique chez l'homme et les animaux, Paris, 1878.
[3] Die Arbeit der Verdauungsdrüsen, Wiesbaden, 1898.
[4] Münch. med. Wochensch., 1895, No. 49.

upon starchy food, digestion thereof continues in the stomach for a very short period, till the acid secretion begins. The final digestion is accomplished in the small intestine.

Volhard [5] also showed that gastric juice has to a small extent even an influence on the digestion of fat by virtue of a fat-splitting ferment present in the gastric juice, and therefore a strict distinction between gastric and intestinal digestion cannot be upheld.

Busch [6] and *Kühne* demonstrated, in a male patient with a fistula in the small intestine, that there was in fifteen to twenty minutes after the ingestion of meat and milk, undigested meat and no curdled milk. This shows that a small part of the food at least reaches the small intestine unchanged, and the latter must accomplish the complete digestion until the food is ready for absorption. However, food which is more readily soluble stays in the stomach for a shorter time, as *Moritz* [7] was able to show that the pyloric part of the stomach discriminates between less and more soluble food in the period of expulsion. By means of the X-ray this statement can be easily verified, as was shown by *Holzknecht, Rieder, Groedel, Albers-Schönberg, Cole, Jaches, Cohn* and others. Nevertheless, *von Leube's* experiments [8] on the diseased stomach still hold good, although he took only the time of retention in the stomach and the subjective complaints into consideration. *Pentzoldt* carried out experiments on a healthy stomach and arrived at the same conclusions.[9] *Von Leube* washes the stomach out after a given meal and works out a scale showing the degree of digestibility of the contents. From this extensive experimental work it is safe to conclude that the power of gastric digestion depends upon four conditions, viz.: the chemical (bactericidal), motorial, sensorial and resorptive properties; and we must agree with *Boas* who judges the digestibility of food in the sick stomach according to which of these functions is disturbed. The exhaustive work of *Adolph Schmidt* and *G. Strassburger* [10] has thrown great light on the digestibility of the different articles of diet, but we must still rely to a large extent upon experience at the bedside.

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[5] Zeitsch. f. klin. Med., 1891, p. 42.
[6] Virchow's Arch., Vol. XIV, p. 150.
[7] Münch. med. Wochensch., 1895, No. 49.
[8] Zeitsch. f. klin. Med., Vol. VI.
[9] Deutsch. Arch. f. klin. Med., Vol. LI, p. 535 and Vol. LIII, p. 209.
[10] Fäces des normalen und kranken Menschen, Berlin, 1910.

Based on the above facts, we can arrive at the following conclusions as to what should be understood by easily digestible food:

(1) The food should offer but little resistance to the digestive juices; i.e., it should be easily soluble.

(2) It should neither retard, nor materially increase peristalsis.

(3) It should not unduly irritate the digestive organs, either chemically or mechanically; nor should it cause much fermentation.

(4) It should be easily absorbable either by the stomach or in the small intestine.

(5) It should satisfy the taste, and neither cause repugnance nor rapid satiation.

LIQUID ARTICLES OF NUTRITION

Pure drinking-water does not excite the gastric juice in a healthy individual, and if taken in small quantities and not very cold, is not appreciably absorbed in the stomach, the greater part passing rapidly into the small intestine.

Whether the dilution of the gastric juice, brought about by the drinking of water, is useful, depends entirely upon the existing affection of the stomach. *Ewald* has shown by experiments that the absorption and propulsion of large quantities of water even in healthy persons takes place very slowly; thus he found by filling communicating tubes with water that it required about one hour and a half for the water to sink 20 centimetres.[11] *Von Mering*[12] confirmed *Ewald's* findings by animal experiments, and *J. Miller*[13] demonstrated the same in human beings. Therefore, the consequences to a patient with atony of the stomach, who partakes of large quantities of water, are self-evident.

The carbonic acid waters excite peristalsis and to a certain extent have an anesthetic effect upon the gastric mucosa. Due to the first mentioned property, which is especially present in those mineral waters that are rich in saline constituents, they ought not to be allowed in acute gastro-intestinal diseases. When recommending the waters, we should think of such that contain the least quantity of carbonic acid,

[11] Klinik d. Verdauungskr., Teil I, p. 187.
[12] Verh. d. Kong. f. innere Med., 1893, p. 471.
[13] Arch. f. Verdauungskr., 1895, No. 3.

so as not to unduly distend the stomach. In recent hemorrhages, these waters are prohibited.

Milk.—From a theoretical standpoint, milk is an ideal nutriment, and until lately it has often been prescribed as a cure for all kinds of digestive disturbances, not infrequently to the detriment of the patient. Milk, in order to correspond with the daily need of nourishment, must be taken in quantities of at least three quarts daily, and in such large quantities it certainly is a burden to the stomach, and if used for any length of time, becomes almost obnoxious to some patients. Furthermore, milk is by no means an easily absorbed food, because 10% of its dry substance is found in the feces.

The coagulation of milk is also to be considered. That, however, can be partially overcome by giving the milk by the teaspoon or by adding rennin or pegnin to facilitate the coagulability. Similar results are obtained by adding lime water, cognac, or boiling it with fine farina or cocoa. In any case a long-continued exclusive milk diet must be considered a starvation cure, and even bedridden patients lose in weight when fed exclusively on milk.

Excellent observers have demonstrated the fact that healthy persons, when partaking of three quarts of milk daily exclusively, show a considerable nitrogenous loss and suffer from muscular weakness. Exclusive milk diet is only indicated in acute inflammatory ulcerative process of the gastro-intestinal tract and in intestinal putrefaction. Milk is best given in a freshly boiled state, because it contains then the least harmful germs and is better digested by the stomach. In sterilized milk the casein is in a less soluble state, and even for artificially fed infants pasteurized milk is to be preferred.

When milk is combined with cereals, it can be borne in larger quantities and is a useful aid to nutrition.

Buttermilk contains less fat and sugar than full milk and has therefore less nutritive value; on the other hand, it contains about 0.4% lactic acid and is beneficial in fermentation and putrefaction. *Uffelman* recommends buttermilk as a diet in febrile diseases, because it contains potassium salts. It is certain that buttermilk excites peristalsis in the majority of persons and is therefore advantageously used in chronic constipation.

Sour milk, in its freshly coagulated state and taken without the cream, agrees with almost every weak stomach. Some patients, how-

ever, experience unpleasant cold sensations in the stomach when taking sour milk, and for these it should be churned before serving.

Sour milk has more antagonizing putrefactive properties than sweet milk, because of the lactic acid bacilli it contains. The latter property is particularly marked in yoghurt, which is made by putting a ferment into the milk, the so-called bacillus Bulgaricus, and *Metchnikoff* caused the manufacturing of a product, called lacto-bacillin, with which yoghurt can be produced in the house.[14]

The favorable influence of yoghurt on putrefaction was shown by *Combe*[15] and *Herter*[16] and others, and we have seen excellent results in intestinal disturbances associated with achylia gastrica.

Kephyr also influences putrefaction favorably, but to a less extent than yoghurt. Kephyr is produced by a kephyrfungus which is added to the milk in closed bottles and allowed to ferment, developing ½ to 1% of alcohol, lactic acid and carbon dioxid. According to the time of fermentation there are three kinds of kephyr, named: No. 1, No. 2, and No. 3, according to whether the milk has been allowed to ferment for one, two or three days. The one-day product has a laxative property, while the three-day kephyr is constipating.

Kephyr must be used with care in certain gastro-intestinal diseases, because of the alcohol and the carbon dioxid it contains.

There are at present tablets in the market, with which to make kephyr at home.

Coffee and *Tea.*—Contrary to cocoa and chocolate which are articles of nutrition, coffee and tea have no nutritive value. Dyspeptic individuals tolerate coffee badly, because the flavoring products resulting from roasting the coffee beans, increase the acid secretion; caffein itself has no such property.

Freshly prepared coffee, especially when taken on an empty stomach, excites intestinal peristalsis in most people, while strong tea has a constipating effect owing to the tannic acid it contains.

Cocoa contains less theobromin than coffee, and more than tea. If cooked in water or with water and milk in equal parts, it contains albumin 3.5%, fat 2.5%, carbohydrates 4%. It also contains 4.5% oxalic acid, while most other nutritive substances contain only 1%

[14] Einige Bem. über Buttermilch. Germ. Transl. by *Dr. Schliep*, Paris, 1907.
[15] Combe-Intestinal Auto-Intoxication, Rebman Company, New York.
[16] Brit. Med. Journ., Dec. 25, 1897; Journ. of Biol. Chem., 1908, Vol. 5.

oxalic acid; hence, in cases of oxaluria, the use of cocoa is to be prohibited.

Oil-free cocoa excites hydrochloric acid secretion, while fat cocoa diminishes gastric acidity.

Chocolate is badly tolerated on account of excessive sugar and flavoring agents it contains.

The addition of milk to cocoa, or of cream to coffee, retards digestion by one hour.

Acorn cocoa contains more nutritive value, tastes better, and is therefore to be recommended. Cocoa mixed with gruel is very nourishing, especially when malt or powdered milk has been added.

Alcohol [17] is indirectly a nutritive substance, because it preserves the fat and the proteid, but it must be taken in very small quantities, as otherwise one-half of it is eliminated. A great deal of the alcohol taken is absorbed by the stomach.

As to the influence of alcohol on gastric digestion, it has been experimentally demonstrated that, when taken on an empty stomach, it increases acidity. This is also the case when it is taken in small quantities during meals, while large quantities retard secretion, disturb pepsin digestion and increase the mucous secretion of the stomach.

Alcohol in large quantities and taken for a long time, usually produces chronic gastritis.

In all chronic gastric disturbances with increased secretion, alcohol is not allowed. In acute diseases, however, associated with cardiac weakness, or in atonic dyspepsia, alcohol may serve as a stomachic when given in small doses. It ought to be given in tablespoonful doses in the form of port wine or two teaspoonful doses of cognac with the yolk of an egg and sugar.

Sour table wine and doubtful red wine should be strictly forbidden to those suffering from gastric diseases.

It should be mentioned by way of caution that sugar added to sour wine will not modify the concentration of the acids contained in the wine; it only modifies the taste.

Wine is only useful, if it contains but a small amount of acids and comes from a good crop; the acids in wine from a bad crop—malic, acetic and citric—are harmful and cause pyrexia.

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[17] Gouraud: "What Shall I Eat?" Rebman Company, New York.

TABLE OF A FEW ALCOHOL-CONTAINING BEVERAGES.

100 Grams.	Alcohol.	Extracts.	Sugar Glycerin.	Nitrogen.	Tannin.	Salts.	Tartaric Acid.	Phosphoric Acid.	Sulphuric Acid.	Potash.	Calories.
White Rhine Wine	9.0	2.6	0.85	0.048	.....	0.23	0.81	0.046	0.02	0.085	.....
Pfälzer Wine	8.11	2.43	1.12	.....	.....	0.21	0.67	0.034	0.034	0.099	.....
White Moselle	7.99	2.24	0.72	0.031	.....	0.175	0.79	0.36	0.026	0.068	abt.
White French Wine	10.31	3.03	0.97	.....	.....	0.25	0.66	0.032	0.038	0.098	60–
Red Rhine Wine	7.70	3.01	.....	.....	0.108	0.218	0.58	.....	.....	.....	70
Red French Wine	7.80	5.56	0.73	0.034	0.18	0.248	0.57	0.03	0.033	0.106	.....
Blackberry Wine	8.55	2.87	0.625	.....	(?) Sugar	0.217	0.651	.....	.....	.....	.....
Port Wine	16.69	8.05	0.43	0.027	5.83	0.23	0.4	0.031	0.023	0.102	145
Sherry	17.45	3.98	0.52	0.027	2.12	0.38	0.45	0.031	0.128	0.206	130
Veuve Cliquot	10.20	10.75	18.65	.....	.....	0.25	0.6	0.016	0.022	.....	200
Cognac	69.5	0.65	.....	.....	.....	0.21	.....	.....	.....	Dextrin	500
Beer	3.93	5.79	0.88	0.74	.....	0.228	CO_2 0.192	0.077	.....	3.73	50
Porter	4.70	2.59	2.62	0.65	.....	0.363	0.215	0.093	.....	3.08	70

TABLE OF A FEW NUTRITIVE AND NON-NUTRITIVE ARTICLES OF DIET IN LIQUID FORM.

100 Parts.	Water.	Albumin.	Fat.	Carbohydrates.	Cellulose.	Ash.	Lactic Acid.	Alcohol.	Calories.
Milk	87.42	3.41	3.65	4.81	.....	0.71	.....	.....	67
Cream[1]	65.51	3.61	26.75	3.52	.....	0.61	.....	.....	215
Condensed Milk without Sugar	53.59	14.62	14.07	15.38	.....	2.34	.....	.....	252
Buttermilk	90.27	4.05	0.93	3.73	.....	0.67	.....	.....	46
Sour Milk	67.0	3.41	3.65	3.50	.....	0.71	.....	.....	66
Yoghurt	73.7	7.1	7.2	8.3	.....	1.38	0.8	0.02	130
Kephyr (2d day)	91.04	3.3	2.25	1.93	.....	0.7	0.35	0.53	42
Tea (5%)	97.3	0.6[2]	0.2	1.0	.....	0.2	.....	.....	6
Coffee (10% black)	94.7	0.5[3]	0.6	1.6	.....	0.4	.....	.....	13
Bouillon	97.5	0.3	0.2	1.25	0.45	0.3	.....	.....	10
Cocoa Powder	6.35	21.5[4]	27.34	34.18	5.44	5.10	.....	.....	480
Cocoa boiled with Water (12:100)	91.5	2.0[5]	2.0	4.0	.....	.....	.....	.....	53
Cocoa boiled with Milk and Water (12:50:50)	88.2	3.6[6]	4.0	5.0	.....	.....	.....	.....	70
							Tannic Acid		
Acorn Cocoa Powder	.....	8.13	14.42	48.5	1.88	.....	1.96	.....	350
Chocolate	1.55	5.06	15.25	74.89	1.15	2.15	.....	.....	445
Hygiama	4.13	27.82	6.65	63.30	0.64	2.46	.....	.....	415

[1] This means centrifuged cream, as top cream used for household purposes contains only 10% fat.

[2] About 0.1 Thein. [3] 0.18 Caffein. [4] 1.82 Theobromin. [5] 0.2 Theobromin. [6] 0.2 Theobromin.

Most dangerous are non-fermented wines, as they produce fermentation, cause decomposition in the stomach, and also have a detrimental influence on the nervous system.

Greek wine, known as "Camarite," is indicated in dyspeptic conditions and some intestinal diseases, owing to the high percentage of tannic acid it contains.

Fruit wine, known as blackberry wine, has the same properties as French claret and is much cheaper.

The other fruit wines are not to be recommended, as a general rule, on account of the malic acid they contain. In some forms of constipation, cider will render good service.

Those known as "gastric remedies" and "appetizers," prepared with bitter substances and sold under the name of "stomach bitters," contain a great deal of alcohol and are decidedly harmful.

Champagne is more readily absorbed, because of the carbonic acid it contains and is a good stimulant in acute diseases. In small doses it is also useful in acute nausea and vomiting. But it should be remembered that it should not be taken too cold. On account of its carbonic acid contents, some of the gas should be allowed to escape so that it may not unduly distend the stomach.

As to alcohol-free wines, more appropriately termed fruit juices, they are recommended when there is a tendency to constipation.

Beer is contraindicated in gastro-intestinal diseases for three reasons: (1) because it is usually taken in large quantities, thereby diluting the gastric juices; (2) because of its bulk it is a burden to the stomach; (3) because the yeast fungus it contains, causes excessive fermentation, though the last named evil can be overcome by pasteurization.

Efforts have been made to increase the nutritive value of beer by adding albumose and malt.

SOLID FOOD

Solid food is harder to digest than liquid, as solids are retained in the stomach by the selective action of the pylorus much longer than liquids. Again, the absorption of solids in the intestinal canal takes place much more slowly than that of liquids or liquefied food.

Eggs are a very concentrated food. One egg equals in nutriment

about 40 grams or 1⅓ oz. of fat meat, or 150 grams, equal to about 5 oz. of cow's milk.

As to their digestible properties, it should be borne in mind that eggs are a rather fatty food and contain fat and albumen in about equal proportion, viz., 5 to 6%.

The egg albumen is almost entirely peptonized in the stomach, and the fat of the yolk is almost completely split in the stomach. The digestibility of eggs depends on the manner in which they are prepared. Hard boiled eggs are difficult to digest by weak stomachs and may even cause painful sensations, because the coarse albumen which is not readily dissolved, irritates the sensitive mucous membrane of the stomach; if taken in pulverized form, they will cause no such disturbance. Omelet soufflée and fried eggs are rather difficult of digestion, while soft boiled eggs and poached eggs, prepared with very little fat, agree best. Eggs, whether raw or cooked, should only be eaten when perfectly fresh. They are a very nourishing food for children, on account of the lecithin and phosphates they contain. With some individuals, however, eggs agree badly.

A diastatic ferment has been found in eggs, especially in the yolk.

In this connection Russian caviar ought to be mentioned, which contains 27 to 30% of proteids and 50% of fat. For weak stomachs none but salt-free caviar ought to be recommended.

Meat.—White meat, such as chicken, veal, sweetbread and thymus, is preferable because poorer in fat and softer in consistency. Meat rich in fat is acted upon with greater difficulty by the gastric juice. Calf's brain, although very soft, contains much fat and is therefore not well tolerated by some.

As to the value of extractive substances, *Senator* [18] rightly points out that not only nitrogenous, but also non-nitrogenous varieties should be considered, for while in the former the difference between dark and light meats is but slight, it is greater in the latter for both raw and roast meats.

The digestibility of raw meat depends on the way in which it is prepared. If scraped very carefully with the handle of a spoon, leaving behind all coarse fibres, it will be well used up by the intestine,

[18] Berl. kl. Woch., 1899, 45.

provided the gastric secretion is normal. In this method of preparation there is the danger of swallowing the eggs of a tapeworm, although it is well to know that mutton does not harbor any. *Adolf Schmidt* [19] points out that with deficient gastric juice, raw meat is not dissolved well in the stomach, while in the presence of excessive hydrochloric acid, both raw and smoked meat will increase the acidity still further. Therefore, raw meat is prohibited in diseases of the stomach.

The length of time ingested meat will remain in the stomach depends upon its fatty content: calf's brain, for instance, is retained for two hours and twenty-five minutes, mutton for five hours and twenty-five minutes.

According to *Pentzold*, sweetbread, veal, haddock, pike, oysters contain 0.4 to 1% of fat;

Beef, hare, spring chicken, pigeon, partridge, carp 1 to 1.5%;

Mutton, pork, contain 5 to 7% of fat;

Goose, caviar, herring, salmon and eel contain more than 8%.

Roast meat is better digested than boiled meat, provided the connective tissue has been made more soluble by hanging the meat up in the refrigerator for a few days, thereby bringing about a post mortem lactic acid process.

A very good way of preparing the meat is to chop and then broil it. Poultry can be better digested boiled than roasted. Among venison, hare and deer have the advantage of less fat content than beef, but the disadvantage of tougher muscle fibre. Meat of young animals is more tender than that of old ones, and hence preferable. Mild, smoked ham is very nourishing, and if there is no danger of trichinæ, had better be eaten uncooked.

Sausages of any kind are not suitable diet for our purposes.

Fish contain large quantities of proteids and gelatinous substances. In gastric disturbances fat fish, such as eel, salmon and herring, should be excluded, the last named also on account of its excess in salt.

The nutritive value of fish is about equal to that of veal. In uric acid diathesis, fish is better borne than meat.

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[19] Münch. med. Woch., 1902, 5, 6, 7.

As to *oysters*, *H. Chittenden*[20] has shown that they are less digestible than is commonly thought, and that they are liable to carry the typhoid bacillus.

SOUPS

All *soups and bouillons* consist chiefly of salts and extractive substances; they merely serve as appetizers by exciting gastric secretion, but have no nourishing value.

In atony of the stomach, hypersecretion and general hyperesthesia, bouillon is contraindicated, as it increases gastric secretion. In hot weather, bouillon should always be freshly prepared because of its tendency to fermentation.

Beef-tea is much more nutritious than ordinary bouillon, and freshly made beef-juice is much more nourishing than any of the other preparations. Predigested proteids, as in the form of pepton and albumose, are only of value in increasing the nutritive property of liquid food in febrile or long-continued wasting diseases; also as an appetizer, when there is diminished secretion of gastric juice (anemia, neurasthenia); thirdly, where gastric motility and secretion are low; and lastly in artificial feeding by stomach tube or per rectum, in order to administer concentrated food. If given for too protracted a period, they will cause diarrhea.

Among the artificial, predigested foodstuffs there are some that contain proteids (hemalbumin, somatose, roborat), others that contain proteids and carbohydrates (aleuronat), other proteids, carbohydrates and fats (plasmon). Roborat, a vegetable proteid, also contains lecithin and glycerophosphates.

GELATINOUS ARTICLES OF NUTRITION

These are made from cartilage, tendons, connective tissue and bone. The gelatin is rapidly and completely decomposed in the intestine, quickly reaches the tissues and serves as a preserver of protein and fats. Gelatinous food also aids the coagulability of the blood; when taken in excess it may cause diarrhea.

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[20] American Journal of the Medical Sciences, Vol. 6, No. 5.

FATS

are preservers of protein. It has been shown that some of the fat-splitting already goes on in the stomach; most of this process, however, takes place in the small intestine by the action of pancreatic juice and bile. Fats with a low melting-point, such as cream, butter, and olive oil, are easily digested and therefore indicated in gastric disturbances like hyperacidity and gastric ulcer, where they have a soothing effect on the mucous membrane and bind the acid.

In cases of disturbed motility, fats are apt to be badly borne.

CHEESE

contains from 25% to 30% of proteids, and from 5% to 30% of fat, according to variety. The most easily digestible is a whey cheese, being poor in fat. The best cheese to increase the fat deposits in the organisms, is cream cheese. Parmesan is poor in fat and, served grated, is admissible in gastric disturbances.

COD-LIVER OIL

is readily absorbed, but has the disadvantage of unpalatableness.

THE CARBOHYDRATES

The carbohydrates have the advantage of causing less decomposition than the proteids, and in some forms of intestinal auto-intoxication or gastrogenic diarrhea (achylia gastrica) they are well borne and must sometimes be administered to the exclusion of all other food. An exclusive carbohydrate and vegetable diet cannot be maintained for any great length of time, as, in order to keep up the body weight, enormous quantities would be required. On the other hand, in combination with eggs, milk and butter, but excluding meat, it is in some forms of gastro-intestinal disturbances (auto-intoxication or neurasthenia) to be highly recommended for a short time.

VEGETABLES

The vegetables, credited with containing iron, show on analysis to possess only very small quantities of the same. Turnips are rich-

est in iron, containing about 0.25%, while the rest of the vegetables, including spinach, contain hardly any at all. Thus, the idea of the nourishing value of spinach being due its iron content, is erroneous.

The cellulose contained in carbohydrates is partly digested by the ptyalin of the saliva, after which it is absolutely essential, as shown by *Adolf Schmidt*,[21] that the further digestion of cellulose be acted upon by hydrochloric acid, the pancreatic juice and, to a certain extent, also by the fermentative bacteria of the intestine. It is, therefore, important from a therapeutic standpoint, when prescribing vegetables, to consider the acidity of the gastric secretion.

According to *F. Möller* [22] cellulose is best assimilated in constipation, while in fermentative dyspepsia, intestinal catarrh and icterus, cellulose is used up but little.

Patients suffering from digestive disturbances should preferably take only such starchy food as contains cellulose in a readily assimilable form and is prepared by cooking.

CEREALS

The cereals (wheat, oats, rye, barley, rice, corn) have an approximate composition as follows:

Water	Proteids	Fat	Carbohydrates	Cellulose
12–15%	10–12%	1–5%	58–76%	0.6–11%

By grinding the cereals, the bran is removed, involving a considerable loss in cellulose.[23]

Rye bread, being baked with leaven, is badly tolerated by individuals suffering from gastric disturbances, as it easily increases the acidity of the stomach.

White bread made with yeast is preferable: the crust is more easily digestible; it can be broken up into smaller pieces which can be better acted upon by the digestive juice; and, besides, the starch in the crust is already partly converted into dextrin by the baking process.

Fresh bread, containing much more water than stale bread, can-

[21] Deutsche med. Wochensch., 1911, No. 10.
[22] Intern. Beitr. z. Physiol. u. Ther. der Verdaungsstör., Vol. 1.
[23] Gouraud: "What Shall I Eat?" Rebman Company, New York.

not be masticated finely enough to be readily penetrated by the digestive ferments. It is, therefore, contraindicated for people with weak digestion.

Zwieback, or dry toast, is still more to be recommended; they contain only about 1½% of water and are partially predigested; they should, however, not be eaten too sweet.

Graham bread (whole-meal-bread) and pumpernickel are richer in cellulose and made without leaven. They presuppose a normal digestion and are useful in appropriate cases of constipation.

The other cereals named are used in the form of soups, by which the granules are made softer and more assimilable, while the starch is partially converted into dextrin. When cooked and strained, they are still more easily digested.

Strained soups, particularly barley soup, have a protective effect on the mucous membrane of the stomach. *Lcube* advises to prescribe unstrained cereal soup when gastric secretion is to be stimulated. Non-strained oatmeal, which is considered to be well borne in gastric disturbances, is, as a matter of fact, but very slowly soluble, exerts mechanical irritation on the gastric mucosa and is only indicated in functional intestinal atony. Rice is softened and thereby made more digestible by long steaming.

Puffed wheat, and still more puffed rice, are predigested by an excessive heating process and therefore well borne even by a weak stomach.

LEGUMINOSÆ

The leguminous vegetables contain about 25% of proteids and about 50% of carbohydrates, but they should be cooked for a long time to make them soft enough for assimilation even by a healthy stomach. They are made more digestible by the addition of a little soda while boiling.

ROOT AND TUBEROUS PLANTS

The nourishing value of these plants does not by far approach that of any of the previous groups. They contain very little proteids, mostly water and only about 8 to 20% of carbohydrates, with the exception of sago and tapioca, which contain about 85% of carbohydrates.

Potatoes are fairly nourishing and best digestible when baked and mashed.

Turnips, carrots, beetroots, are not as nourishing as potatoes and are borne best when in the form of purée.

Green vegetables like lettuce and cauliflower are not allowed in the dietary kitchen on account of the cellulose they contain and their tendency to cause fermentation. The crown of young cauliflower plants may be used, also finely chopped spinach and asparagus-tender-tips. The above-named vegetables, and lettuce leaves with lemon juice, cream, or olive oil, are fairly well borne and beneficial in functional constipation.

FRUITS AND BERRIES

Fruits and berries contain chiefly water, little carbohydrates (2 to 6%), 2% acids and 1 to 10% of sugar. Grapes contain about 20% of sugar. Pineapples, cherries, and apples, are claimed to contain a proteid-digesting ferment, called bromelin.

For the dietary kitchen, all fruit should be peeled and cooked. Apples and pears are well borne in the form of purée by the most sensitive stomachs owing to the small quantities of acid they contain. Grapes, with an average content of 15% of sugar, favorably influence peristalsis, especially in atonic constipation, if given in quantities of half a pound at first and gradually increasing to about one and one-half pounds, half an hour before breakfast.

The other berries which contain citric acid and malic acid are not to be recommended, except as juice. Strawberries with milk have a constipating effect in tropical diarrhea.

Huckleberries, in the form of juice, are useful in diarrhea on account of their tannic acid content.

SEED FRUIT

Almonds, Acorns, Chestnuts.—A nourishing and very pleasant beverage is made from almonds (see p. 45), which is used in certain forms of intestinal catarrh. Decoction of acorns, preferably in the shape of acorn cocoa, is useful in constipation. Chestnuts are only permissible when finely ground and in very small quantities. Walnuts and hazelnuts contain a high percentage of albumen

and fats; also some phosphorus; but an irritating oil which interferes with digestion. Ripe bananas contain 1 to 2% of starch and about 70% of sugar, while the green banana contains 80% of starch, 3 to 4% of sugar, and no acid. Its dietetic use in hyperacidity must be determined in each individual case, as, according to our experience, this fruit is not borne very well.

SUGAR

Among the carbohydrates, sugar must be mentioned as an article of nutrition. It occurs as cane-sugar in the sugar cane and the beet-root; as grape-sugar in fruit, honey and manna (the last named containing also fruit-sugar); and as milk-sugar in milk.

Cane-sugar must first be inverted to a large part before assimilation, while grape-sugar and maltose are absorbed as such.

It has been shown by *Straus* [24] and others, that sugar causes the gastric glands to pour into the gastric cavity a dilute juice and is therefore appropriate in gastric disturbances associated with hyperchlorhydria.

Milk-sugar has a laxative property and is therefore given in tablespoonful doses with milk or cocoa, where such an effect is desired. *Ewald* prescribes a grape-sugar solution as the first ingestion allowed after gastric hemorrhages.

Honey, which contains 30% of sugar, is one of the dietary articles recommended in constipation.

Among other preparations to be mentioned in this connection is malt extract, which contains 50% of sugar.

SPICES

The most important of the spices is sodium chloride. It not only stimulates salivary secretion in the mouth, but also causes reflex stimulation of gastric secretion. The quantity of salt allowed in the diet should, therefore, be determined according to the secretory condition of the stomach.

Other important salts for maintaining the body equilibrium are sodium and potassium phosphate and the iron salts.

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[24] Zeitsch. f. klin. Med., Vol. 29.

Saccharin, which has not the same nutritive value as sugar, serves only as a spice and is borne badly by some patients. In diabetes it has been used with advantage. Also against intestinal fermentation. A small tablet corresponds to one and a half pieces of sugar.[25]

Other condiments, like pepper and mustard, are contraindicated in gastric disturbances. Nor are onions, garlic, cinnamon, dried lemon and orange peel, allowed, while anise and cloves in minute quantities may be used. Caraway, camomile, peppermint leaves and fennel leaves, in the form of infusions, have a favorable influence on gastro-intestinal fermentation.

The least harmful condiment is vanilla.

While it is true that the above named spices are appetizers, it is essential to get along without them—with the exception of salt—in the dietetic kitchen. There are other ways of preparing food in a palatable manner.

Following is a list compiled by *Penzoldt*,[26] showing how long various articles of food should remain in the normal stomach:—

Grams	One to Two Hours
100–200	Pure water
220	Carbonated water
200	Tea, without additions
200	Coffee, without additions
200	Cocoa, without additions
200	Light wine
100–200	Boiled milk
200	Bouillon, without additions
100	Eggs, soft boiled
	Two to Three Hours
200	Coffee, with milk
200	Cocoa, with milk
300–500	Water
300–500	Boiled milk
100	Eggs, raw, poached eggs, hard, or omelet
250	Calf's brain, boiled
250	Calf's sweetbread, boiled
72	Oysters, raw
200	Carp, boiled
200	Pike, boiled
200	Codfish, boiled
200	Haddock, boiled
150	Cauliflower, boiled
150	Asparagus, boiled
150	Potato, mashed
150	Cherries, compote
150	Cherries, raw
70	White bread, fresh or stale, dry or with tea
50	Albert biscuits
	Three to Four Hours
230	Spring chicken, boiled
230	Partridges, roast
220–260	Pigeon, boiled
195	Pigeon, roast

[25] In the United States of America the importation and sale of saccharin has recently been forbidden by law.

[26] Allgem. Behandl. d. Magenkrankh., p. 249.

Grams	Three to Four Hours
250	Beef, raw, boiled
250	Calf's feet, boiled
160	Ham, boiled
160	Ham, raw, boiled
100	Roast veal, warm, cold
100	Roast steak, cold or warm
100	Steak, raw, grated
72	Caviar, salt
150	Pumpernickel
150	Rye bread
150	White bread
100–150	Albert biscuits
150	Boiled rice
150	Boiled kohlrabi
150	Boiled carrot
150	Boiled spinach
150	Apple
	Four to Five Hours
210	Roast pigeon
210	Roast fillet of beef
250	Steak, fried
250	Ox tongue, smoked
240	Partridge, roast
150	Lentil purée
200	Pea purée
150	Boiled green beans

NUTRITIVE VALUE OF FOOD IN REFERENCE TO ITS ASSIMILATION

In prescribing a certain diet, it is necessary not only to consider the digestibility of the food, but also the quantity and its nutritive value. Of still greater importance is it to know how the different articles will mix in order to assure the most favorable assimilation. The conclusions drawn from the investigations of men like *Rubner, Pettenkofer, von Noorden,* are the following: A man at rest, or doing light work, needs: Proteids 110 grams (3.88 oz.); fat, 50 grams (1.76 oz.); carbohydrates, 450 grams (15.87 oz.) per kilo body weight. Later investigations, however, have shown that the proteids may be reduced to 80 grams (2.82 oz.) daily and the difference be replaced by carbohydrates and fat.

Chittenden, who experimented on 26 persons for nine months, showed that they maintained weight and did some physical work on 2 to 2½ oz. of proteids per kilo bodyweight.

Of late a great deal of importance has been attached to the calorimetric value of the food, and according to *Rubner* nourishment should be equal to 34 calories per kilo bodyweight at rest, and 40 to 50 calories at work; or according to *Hirschfelder,*[27] equal to 2,400 to 3,000 calories in twenty-four hours. Considering, however, that we have sick people to deal with who are mostly at rest, we ought

[27] Grundzüge der Krankenernährung, 1892.

to be able to get along with still less calories, especially if particular care is taken to administer easily digestible food of high caloric value. This can be accomplished by first taking into consideration how much water a certain nutriment contains; the less water it contains the more nourishing it is. Meat loses 50% of its weight by boiling or roasting, it is therefore more nourishing than raw meat; and zwieback loses 30% in weight through the double baking process, and is more nourishing than white bread.

While the fats have the highest caloric value, it should be borne in mind that the carbohydrates are more easily digestible, and when it is desirable to reduce the daily ratio of proteids, the carbohydrates can be increased accordingly, and they will tend to replace the proteids which is not always the case with fat.

The caloric value of alcohol is midway between fat and proteids, but the indication for its use is limited to acute diseases and only as an adjuvant to stomachics.

In view of the fact that proteids have a tendency to decomposition, especially where digestion is impaired, there is increased danger of auto-intoxication, and therefore the correct way is to substitute as much as possible the proteids by carbohydrates and fat with a low melting-point.

The condition of the patient should also be taken as a guide as to the kind of food he can take best and would give him the least discomfort when suffering from an organic gastro-intestinal disease.

The calculations have been based upon the following figures which have been generally accepted:

1 gram of albumen corresponds to	4.1	calories
1 gram of carbohydrates corresponds to	4.1	calories
1 gram of fat corresponds to	9.3	calories
1 gram of alcohol corresponds to	7.0	calories

The daily need of water of an adult varies with bodyweight, habits and season of the year, but the daily waste of water through urine and feces may be taken at about 1,800 grams, and that through the skin and lungs at 2,000 to 2,500 grams. This is equal to three to three and one-half quarts and would have to be replaced by beverages in the shape of coffee, tea and water, and the water contained in the solid food.

Assimilation of the food by the digestive tract must also be taken into consideration. Thus, it has been shown that 3 to 5% of proteids ingested through animal food, and 20 to 40% ingested through vegetable food is excreted in the feces. Of carbohydrates, rice and white bread are assimilated up to 1%; dark bread, potatoes and carrots up to 11, 8 and 18%, respectively.

Mixed diet is assimilated best. Fats in liquid form and of low melting-points are almost completely absorbed. If food is ingested in excessive quantities, part of it will be found in the feces undigested even in healthy individuals, and the undigested percentage will be larger in pathological conditions.

It has also been shown that with impaired gastric digestion food can be thoroughly assimilated as long as the intestinal digestion is fully intact.

DIET IN FEBRILE GASTRO-INTESTINAL AFFECTIONS

Fever accompanying gastro-intestinal disturbances causes, like other fevers, metabolic changes, as shown by loss in weight as the result of the increased loss of nitrogen and carbon. Should the fever be prolonged, it follows that this exaggerated loss should be replaced by food of least disturbance to the gastro-intestinal tract.

The proteid loss being the greatest, it would seem proper to replace it by a diet rich in proteids. Such, however, cannot be the case, since fever patients do not bear proteids well. We therefore replace the proteids by the more digestible carbohydrates, liquid fats, gelatinous substances, and salts.

Water should be liberally taken, as it washes away a large quantity of the toxins. Barley, maize and farina are the cereals doing the greatest good in febrile conditions. If carbohydrates are not allowed, they may be replaced for a while by a 10% solution of grape-sugar. As to alcohol, we are not in favor of using any at all in fever of gastro-intestinal origin, and we have even found that champagne which is often prescribed to relieve vomiting, rather aggravates than improves the symptoms.

Directions for the Preparation of the Most Simple Daily Dishes for Special Dietetic Purposes

INTRODUCTION

An appetizing preparation of the dishes is just as important as the prescription of the same, as patients with gastric disturbances can easily be nauseated by the repugnant appearance of a dish, while, on the other hand, the appetite may be stimulated by an inviting way of preparation.

Food should never be served too hot, lest the patient be tempted to partake of it in that condition in spite of the physician's warning. The best plan is to provide a second plate or cup into which the hot dishes may be poured at the table.

Nor should it be too cold, and it is advisable to serve such dishes as are liable to cool off rapidly, in vessels with a double bottom, the interspace being filled with hot water.

In regard to condiments, nothing but the moderate use of salt is allowed, while spices should not be used without the permission of the physician. Orange or lemon peel should be excluded from the dietetic kitchen. Water intended to be used for cooling drinks, had best be boiled first and cooled, unless good spring water can be obtained.

The measures mentioned in the various recipes are calculated as follows:

1 teaspoon: about .... 5 gm.	1 soup plate: about.. 250 gm.
1 tablespoon: about .. 15 gm.	1 cup: about..200 to 250 gm.

1 wineglass: about 150 gm.

SOUPS

Almond Milk

Take 30 gm (1 oz) of sweet almonds and 2 bitter almonds. Put almonds into boiling water for a few minutes, when skin will peel off readily. Grind almonds in an almond grinder, add ½ lb (½ pt) of warm water, or warm milk, stirring constantly. Allow this mix-

ture to stand for 2 hours, then strain through a cloth. Press out the juice thoroughly.

30 gm (1 oz.) almonds = 300 calories
250 gm (1 tumblerful) milk = 170 calories

Beef-Juice

Take ½ kg (1 lb) lean beef, cut into small pieces, put same between broiler and allow to brown a little. Remove meat from broiler while hot, and put into a lemon squeezer or beef-juice press. Extract juice into a china vessel.

Frozen Beef-Juice

1 kg (2 lbs) beef, cut into pieces size of the palm of the hand. Wrap the beef in a clean, coarse, large, woven cloth. Put under a meat press and press out juice slowly. Out of this is obtained about 500 gm (2 tumblersful) of juice.

To this can be added 250 gm (1 tumblerful of sugar, eventually adding vanilla extract), 20 gm (¾ oz) fresh lemon-juice and 20 gm (¾ oz) cognac, into which the yolk of three eggs have been beaten. Stir thoroughly.

The entire mixture to be put into a freezer.

Note.—Lemon-juice must not be used for those having hyperacidity.

Bottled Bouillon (beef-tea)

Take ½ kg (1 lb) lean beef, cut into small pieces, put into a clean bottle with a wide opening; seal same, either with a large cork or antiseptic cotton. Put bottle into a vessel filled with warm water, allow water to boil slowly ½ hour. This bottle will contain 100 gm (½ tumblerful) of brownish colored broth. Pour same from bottle as it is.

Plain Bouillon

Take ½ kg (1 lb) lean beef, cut into small pieces, put same into a vessel holding about 3 lbs (6 pts) and having a well-fitting cover (or use a double boiler). Fill vessel with cold water, put meat into it, and allow it to cook for 3 to 4 hours.

According to the strength required it is better to add boiling water afterward, making the bouillon stronger or weaker, as desired. This contains about 2 lbs (4 pts) of bouillon. Meat not to be used again.

To obtain a better taste and color, one can brown the meat in a hot dry pan before putting the meat into the 6 pts of water.

Soup with Cereals

Soak in cold water the night before, either barley, greenkern, rice or oatmeal, until the following morning. Pour off the water, scald the cereals with hot bouillon or with hot water, put on stove and let cook for at least three hours. Patients with hyperacidity should have this soup cooked in water. Half an hour before serving, strain the soup through a fine hair-sieve, then add a little meat extract and boil up again. Salt to taste. The yolk of an egg can also be added to one plate of soup.

Tapioca Soup

For 1 plate take 1 soupspoonful of tapioca, to be poured into boiling bouillon, stirring constantly. The soup must boil until the tapioca is soft. A little meat extract as much as the point of a knife will hold, and the yolk of an egg will add greatly to the taste of this soup.

Calves' Milk or Sweetbread Soup

Put the sweetbreads into cold water for about 1 or 2 hours.

It is best to change the water often, so that the sweetbreads get nice and white. Cook in weak bouillon or slightly salted water until soft. Take the sweetbreads out of the water, carefully remove the skin and cut into pieces the size of a walnut; add enough bouillon for one plate.

For easier digestion the sweetbreads can be strained through a hair-sieve, then add the bouillon and stir until smooth. The yolk of an egg can also be added.

Brain Soup

Put into cold water 1 calf's brain for one hour, so that all blood contained therein will come out. Pour off the water. Again wash

the brain thoroughly. Cook one hour in slightly salted soup or salt water (to which 1 teaspoonful of soup has been added). Strain through a fine sieve, thin the mixture with soup and cook again. When serving, the yolk of an egg can be added.

100 gm (¼ lb) calf's brain = 140 calories.

Meat Dumpling Soup

Scraped beefsteak, raw, to be chopped very fine and then pressed through a sieve, mix with the yolk of one egg. Divide mixture into larger or smaller quantities and drop one by one into boiling soup.

Thick Meat Soup

Twenty gm (¾ oz) of dry bread, grated, are cooked for ¼ hour in ⅜ lb (⅓ oz) of bouillon. Chop very fine some chicken meat, strain through a hair sieve 25 gm (about 1 oz) of this with a tablespoonful of cream or one teaspoonful of meat pepton and stir thoroughly. Add a few spoonfuls of soup. The entire mixture to be beaten. Serve without cooking again.

Zwieback Soup

Thirty gm (1 oz) unsweetened zwieback, with 10 gm (a little more than ¼ oz) butter to be roasted; the butter not to get brown. Add ½ lb (1 pt) of bouillon and cook slowly for half an hour. Beat yolk of one egg with one tablespoonful of sweet or sour cream and add to the soup. Strain the entire mixture into a warm plate = about 240 calories.

For patients with sensitive stomachs the soup can be prepared without the cream.

Soup Biscuits

Forty grams (a little more than 1¼ oz) of butter is beaten for ¼ of an hour. Add 2 eggs, a little salt and 40 gm (1¼ oz) of flour; also 3 gm (⅛ oz) of baking-powder.

Take a square pan, butter same, put mixture into pan and bake into a moderately hot oven for half an hour.

When the baking is finished and cooled off, take out of pan and

cut into cubes. These biscuits can be put into different kinds of soups, such as brain and sweetbread soups. The entire quantity contains about 130 calories.

Noodle Soup

The noodles must boil for ½ hour in very strong bouillon. A soup made of about 10 gm (a little less than half an oz) of thread noodles contains about 50 calories.

Butter Dumpling Soup

Beat 30 gm (1 oz) fresh butter for about ¼ hour, add 1 egg and a little salt, and mix thoroughly. Add 30 gm (1 oz) of flour. Use a teaspoon for dropping the batter into the boiling soup. Let boil for about 10 minutes on a moderately hot stove. The entire quantity contains about 420 calories.

Egg Dumpling Soup

Thoroughly mix the yolk of 2 eggs with 6 gm (¼ oz) of flour. Beat stiff the whites of two eggs and add to above. Drop the dumplings into the soup with a teaspoon, allowing them to boil up once or twice. Take out the dumplings carefully with a skimmer, so they will not break, put into the soup-plate, and then add the soup.

Calories, 160.

FISH

Fish, as a diet for patients, should never be fried or baked—only boiled.

The fish that can be used from lakes and rivers are the carp, trout and pike. Clean the fish thoroughly, carefully removing the scales. Rub the inside of the fish with salt and boil in well salted, boiling water for about ¼ to ½ hour, according to size of fish. Use no seasoning, although a handful of dry vegetables can be put into the water.

Do not use rich sauces. Even pure, hot butter is sometimes not

digested by those having sensitive stomachs. The best way to serve the fish is with a little fresh butter.

The salt water fish that can be used are codfish (Gadus morrhua and Gadus calarias), fresh or dried, sole or plaice. They are put into well salted cold water and allowed to boil 30 to 40 minutes, according to size. Dried codfish (haddock), sole and plaice are put into well salted boiling water and boiled until soft.

Minced Fish Steaks

Half a kilogram (1 lb) of fish which has been cleaned, skinned and all bones removed, is chopped very fine. Soak a small piece of white bread in milk, press it out thoroughly, put same into 5 to 20 gm (⅛ to ⅜ oz) of drawn butter ("oil-butter"), put on stove a few seconds and stir. Beat the yolks of 2 eggs, add to above and salt to taste. To make the above into fish cakes, dust them on both sides with bread-crumbs, which have been strained through a sieve. Bake some in 30 to 40 gm (1 to 1⅛ oz) of butter in a moderately hot oven. After the fish steak is baked, pour off some of the butter and add a few teaspoonfuls of clear bouillon. Cook again and serve. This contains about 600 calories.

Fish Cutlets

Use large fish. After same have been thoroughly cleaned, skin, scales and bones removed, they are sliced into finger-sized pieces and salted. After ½ hour, bake cutlets in browned butter for about 6 to 8 minutes on both sides, turning them several times.

ROASTS

In buying beef, it is essential not to buy it too fresh, and only to deal with a thoroughly reliable butcher. Meat should be at least four to eight days old.

Roast Filet

Remove all fat and skin and pound the meat well. Wash it, salt it and put it into a casserole with hot fat, turning meat several times.

The meat will lose in weight about 10% in a quick oven and about 30% in a moderate oven.

In order to have the meat rare (underdone), reckon ¼ hour to every lb of meat; therefore a 4-lb piece of beef will need 1 hour for roasting.

Roast Beef

To be prepared just like the filet, except that a heavier piece of meat is used.

Raw Beefsteak

Use loin of beef. Scrape same with the dull handle of a spoon, until about 150 gm (a wineglassful) have been procured. Can be served raw or just slightly fried in butter.

100 gm (3¼ oz) are about 130 calories.

Beefsteak

Take a good piece of steak, cut a square piece, the thickness of a thumb. Pound the meat well, salt on one side only. Put into frying pan, fry in fresh butter for 1 minute. Turn meat and baste with the juice of the meat and again fry only ½ minute. Serve at once on a hot plate.

100 gm (3¼ oz) are about 130 calories.

Roast Veal

Take the loin of veal, remove the thick skin. In summer the meat must soak in sweet milk for 1 or 2 days, in winter about 2 to 4 days. This makes the meat soft and tender.

Before preparing the meat, it must be thoroughly washed, skin removed and well salted; lard the meat with fresh pork and roast in hot butter or hot beef fat, using about 200 gm (a little less than ½ lb). The roasting is the same as other roast, only it must be well done and will take 1¼ to 2 hours.

If the bone is not removed, a good juice will come forth, and after the fat has been removed, a little bouillon (no flour) added will give a nice sauce.

Fricandeau of Veal

This is the best and softest part of the loin. Should be roasted quickly, allowing ¼ hour to the lb.

Mutton Cutlets

Remove all fat, pound same, wash the meat, then salt it. Dust in flour on both sides and fry for about 6 minutes in fresh butter.

Shoulder and Leg of Lamb

Put the meat into cold milk for 1 or 2 days. Before roasting, wash the meat and put it into a clean, dry cloth.

The shoulder of lamb needs ¾ of an hour for roasting, in a hot oven; the leg of lamb needs 1½ hours. Baste as other roasts. A little wine or sour cream can be added, to give a savory taste, although without this addition it is easier digested.

Pork Fillet (Tenderloin)

An easily digested meat is the pork tenderloin. Pound it well, salt and roast for ½ hour.

Roast Poultry

It is best to buy fresh-killed poultry. Clean, remove feathers, and hang in a cool place for at least one day; in the winter for 2 to 3 days. The roasted skin of poultry should never be served to those having stomach trouble, as it is very indigestible.

Broilers

Before removing the feathers, scald the broiler, singe it to remove all hairs, wash carefully and salt both inside and outside.

Put into a casserole containing a great deal of hot butter, baste frequently until it is brown on both sides. It will take ¾ to 1 hour, until the broiler is finished.

100 gm (3¼ oz) chicken, raw, are 100 calories.

Capons

Capons and pullets should be roasted with very little butter, as they contain a great deal of fat. Baste constantly and roast about 1½ to 2 hours.

Squabs

Prepare just like broilers, and let them roast for about ¾ of an hour.

Boiled Broilers and Squabs

Preparation just before boiling the same as for roasting. Put into slightly salted, boiling bouillon a handful of dry vegetables and boil about 1 to 1¼ hours. Very young pigeons or squabs will be finished in ¾ of an hour; also very young chickens or broilers.

Roast Venison

Roast in hot butter and baste frequently; 1 hour required for roasting. The loin of venison is not so tender and will take 2½ hours to roast. Sauce to be prepared same as the roast filet sauce. Sour cream can be added to the sauce.

Venison Cutlets

Cut the meat into small pieces as thick as a finger, pound these slightly, dip the cutlets into drawn butter ("Oil-butter"), put one cutlet on top of the other and allow to remain overnight. Next day salt the cutlets on both sides, fry in hot butter to a nice light brown. Pour sauce over the cutlets and serve with mashed potatoes.

Shoulder of Venison

Roast shoulder of venison is the most conducive to sensitive stomachs. It should be prepared with a great deal of butter and frequently basted. It will take 1 hour for roasting. For less sensitive stomachs sour cream can be added to the sauce.

Stewed and Potted Meats

Use meat from leg, cut into pieces the size of a walnut. Put a small piece of butter into a casserole, let it melt, put the meat into the casserole, adding a little salt, also bouillon, stir the meat and cover it.

It will take 1¼ hours on a moderate fire, adding gradually a little more bouillon.

Stewed Sweetbreads

Cook the sweetbreads until very soft, remove skin, cut in two halves and put into hot butter sauce for 10 minutes before serving. The butter is prepared in this way:—Take a piece of butter, put it into a saucepan and let it melt, but not get brown. Add 1 tablespoonful of flour, stir, add enough cold bouillon and a little white wine, so that after boiling there will be a thick sauce. The sauce will be easier to digest, if instead of butter, gravy from any roast meat is used, but the fat must be taken off first. Before serving, an egg can be added to the sauce.

Stewed or Potted Broilers and Squabs

Prepare broilers or squabs same as for roasting. Cut into 4 equal parts, add a little salt and stew exactly like stewed veal for about ¾ hour. Sauce to be prepared the same as for stewed veal.

Chopped Meat

When buying meat for chopping, it is always best to buy fresh, lean meat and chop the meat at home instead of having it chopped by the butcher. If a meat-chopping machine is not available, a meat-chopper can be used, no matter how difficult it may seem.

Hamburger Steak

Take a nice piece of beef, chop about 250 gm (a tumblerful), add 3 to 4 tablespoonfuls of cold, salted bouillon. If bouillon is not available, use salted water. Fry the meat about 10 minutes. Chopped veal can also be prepared in the same way.

Veal Dumplings

Chop 1 lb of veal (loin); 40 gm (1¼ oz). Butter, with 2 eggs, some bread-crumbs, a little salt, a little chopped parsley beaten up together. Make the dumplings flat and boil in salted water for ¼ hour. Dumplings can be served either with a butter sauce (or sardine sauce, if permissible). Pour the same over the dumplings ¼ hour before serving.

100 gm (½ cupful) = 225 calories.

Hash

Use any good roasted meat which has been left over (veal, chicken, venison), mince the meat and put into a little butter or clear fat. Let it steam for about 5 minutes, stirring constantly, and baste. If a sauce is wanted, it can be prepared as follows: Sprinkle the meat with a little sifted flour, mix thoroughly with the meat, add a little white wine and enough bouillon, so that it becomes a thick mass. Steam again in a tightly covered vessel for about ¼ hour on a moderate fire. A little meat extract may be added to improve the taste.

100 gm (1 cupful) = 225 calories.

Omelet Soufflée

(Made from left-over roasted meats)

Forty grams (1⅓ ounce) of minced meat, mixed with 1 tablespoonful of sweet or sour cream. Add a little salt, yolk of one egg. Beat the white of one egg separately and add to the above. Put into a small porcelain baking dish and bake in a hot oven for 20 minutes. (The sauce from any roasted meat can be added.)

215 calories.

Calf's Foot Jelly

Take the calf's feet, remove the skin and meat, crack the bones, and put all into a vessel filled with cold water. Let boil until the

scum appears on the surface. Pour off the water and rinse the ingredients in cold water.

Take ¼ kg (½ lb) of beef, or half a fowl, with 4/5 of a lb (about 1 pt) of water and 5 gm (less than ⅛ oz) of salt and let the whole boil slowly for 4 to 5 hours. Put the whole into a sieve, drain, and let it stand in a cool place. Next morning, remove the fat. Add to the clear jelly 1 egg with its crushed shell, stirring and beating constantly. Put on the fire, keep stirring, and do not let the temperature exceed 60° R. (167° F.). As soon as the jelly commences to granulate, cover it and keep in a cool place until the white of the egg is precipitated in flakes.

Strain the jelly several times until perfectly clear, add 5 gm (⅛ oz) of meat extract and pour the jelly into a mould. Serve jelly with cold poultry.

Jellies made from Chicken and Veal

Cut a fowl into 4 parts, wash them well, add 2 calf's feet and 1 lb of veal (loin). Cut into pieces, put into a vessel holding 4 lbs (4 parts) of water. Let boil slowly for 5 hours. Pour off the water and strain through a fine cloth; add 1 glassful of white wine (if allowed), or 1 tablespoonful of clear beef-soup. Put into a jelly mould after having rinsed the mould out with cold water.

Milk Jelly

Two litres (4 pints) of milk; boil for 5 to 10 minutes, with 250 gm (1½ cups) of sugar and let cool. Make a solution of 30 gm (1 oz) of white gelatin, add 250 gm (1½ cups) of water, 3 wineglassfuls of good white wine (400 gm), 1½ tumblers, or 30 gm (1 oz) of cognac; stir all slowly. Add to above. Pour into a mould and let cool.

100 gm (½ cup) are 250 calories.

VEGETABLES

Asparagus

Clean asparagus, remove skin, cut off the hard parts. Boil in salted water for about ½ to 1 hour. Use enough water, otherwise

the asparagus will lose its color. Serve with a butter sauce, adding yolk of 1 egg. For sensitive stomachs use only asparagus tips.

100 gm (a little less than 1½ oz) are about 20 calories.

Spinach

Clean and wash spinach thoroughly, remove the stems and rinse in water several times. Boil quickly, putting the spinach into boiling water. When soft, pour spinach into a sieve and allow it to drain; then mash through the sieve. Put a lump of butter into a saucepan. When dissolved, add a little flour and bouillon, making a thick sauce; keep it on the fire, stirring constantly; add the spinach and boil all for about ¼ hour.

Lettuce Purée

Take 2 or 3 heads of salad (Romaine preferred) using only the hearts. Separate the leaves, rinse in cold water, scald with boiling water, and let the salad boil in salted water until soft. Put into a colander and let drain; then mash thoroughly.

Melt a piece of butter, add a little flour, not allowing it to brown, stir well, add the salad, also a little beef-soup and boil everything for a few minutes. A little sweet or sour cream may be added, if permitted.

Endive Purée

Use the tender stalks of endive salad, scald them 2 or 3 times with boiling water, so they may lose the bitter taste. Boil quickly in salted water until soft. Pour off the water and put cold water over it, drain again, and squeeze the endive thoroughly. Chop the stalks and mash through a sieve.

Melt a small piece of butter, add a small spoonful of flour, allow it to brown, add the mashed endive, add a little salt, a little clear soup and stir until it becomes a thick mass.

Oyster Plant

Clean and wash the oyster plant thoroughly, cut into pieces the length of a finger. Take 1 teaspoonful of flour, add 1 lb (2 pts) of

water and 1 tablespoonful of vinegar, stir same until smooth and put the oyster plant in.

Put all into a colander, pour cold water over it and let drain. Put into a cooking vessel containing some butter, cover tight, add a little salt and a little bouillon from time to time while cooking. It takes ¾ to 1½ hours to cook oyster plant until soft.

100 gm (a little more than 1¼ oz) are about 120 cal.

Green Peas

It is best to use canned peas of the very best quality. Empty the peas into a sieve, pour cold water over them and strain. Prepare with a little butter and salt and let them boil for about ¼ hour, adding strong bouillon and a little sifted flour.

The peas can also be mashed through a sieve. Split peas can also be used for this purpose.

Purée of peas are considered best for those having stomach trouble. Let the dry split peas boil for about ½ hour.

280 gm (about ¼ cup purée), 100 gm (¼ lb) = about 160 cal.

Carrots

Only small carrots should be used. Clean and wash them and cut them into lengthwise pieces; prepare like peas or oyster plant. The carrots can be served mashed. After the carrots have been boiled, mash them through a hair sieve, dust with a little flour and boil until they become a thick mass.

100 gm (a little less than ¼ lb) = about 120 cal.

String Beans

Young string beans are the best to use. Clean and wash them, cut into thin slices, and prepare same like peas in butter and beef-soup. If fresh beans are not in season, canned string beans can be used.

100 gm (¼ lb) = about 40 cal.

Cauliflower

Clean and wash the cauliflower and cook just like asparagus. Time required, about ½ hour. For those with stomach trouble use only the upper part, not the stems.

100 gm (less than ¼ lb) = about 60 cal.

Red Cabbage Purée

Slice the cabbage on a slicing machine. Stew in butter and beef soup about 1 to 2 hours, until soft. Mash thoroughly and stew again, adding a little wine and a lump of sugar; also a pinch of flour.

Rice

Wash 30 gm (10 oz) of rice thoroughly in cold water; then let it soak in cold water overnight; put a pinch of soda into the water. Next day pour off the water, put the rice into a casserole, add a piece of butter and some beef-soup, then let stew for about ¾ of an hour. Keep the casserole tightly covered. Before serving, beat the yolk of an egg and add to the rice.

Rinse a mould with cold water, put the rice in it for about 2 minutes; then take the rice out of the mould.

This quantity is for one person only.

Rice can also be prepared with water and butter, as the addition of bouillon is in some cases not easily digested by sensitive stomachs.

Calories: 225.

EGGS AND FARINACEOUS EXTRAS SERVED WITH MEAT

Scrambled Eggs

Thoroughly beat 2 eggs, add a little salt, put into a saucepan 5 gm (⅛ oz) of butter, allow it to melt, add the eggs, stir constantly and keep same on fire until it thickens. Serve at once on a hot dish.

2 eggs = about 200 calories.

Mashed Potatoes

Peal and wash ¾ lb potatoes, cut into 4 parts, boil in a double boiler until soft. Put the potatoes into a hair-sieve, mash thoroughly, add 20 gm (¾ oz) of fresh butter, a little salt and 60 to 70 gm (2½ oz) of hot milk, put back on the fire, stir constantly until smooth and thick. Serve at once.

100 gm (3½ oz) are about 125 calories.

Clear beef-soup may be added instead of butter, if so desired.

Farina Dumplings (a)

Put 60 gm (2 oz) of farina into ¼ lb (1½ pts) of boiling milk. Pour the farina slowly into the milk to avoid its getting lumpy. When thick, take off the fire, add 1 egg, put back to the fire, but do not let the farina get too hot. Melt 15 gm (½ oz) of butter, dip a flat spoon into the butter, then into the farina, drop into the hot milk one by one. Then place the dumplings on a dish and serve at once.

Calories: 550.

Farina Dumplings (b)

Put 50 gm (1¾ oz) of butter into 1¼ lb (2½ pts) of boiling milk, add a little salt and ½ lb of farina. Boil until stiff. Let the mixture cool off and add 5 eggs. Drop the dumplings into boiling salt water with a spoon and let them boil for about ¼ hour. This portion is large enough for 4 persons.

Farina Dumplings (c)

Boil ½ lb farina in 1 lb (2 pts) of milk until soft. Let it cool off and add 6 eggs and a little salt. Cut 2 slices of bread or rolls into small squares, roast in hot butter, add to the farina and mix well. Put everything into a pudding dish and let it steam therein for 1 hour.

Calories: 1700.

Potato Dumplings

Boil 20 tablespoonfuls of grated potatoes the day before using and mash thoroughly. Add 50 gm (1¾ oz) of butter, mixing thoroughly, also the yolk of 3 eggs, mixing in one after the other with a little salt. Previously, boil 50 gm (1¾ oz) of farina in milk until it thickens, let cool a little. Beat the whites of the 3 eggs, mix, and finally add the grated potatoes.

Dip the hands into flour and form lengthwise dumplings which boil in salt water for 15 to 20 minutes.

Macaroni

Boil the macaroni in salt water (boiling) for about 10 minutes, pour off the water and again add boiling salt water, allowing the macaroni to boil for ½ hour. Pour into a colander and strain. Put a piece of butter into a casserole, add the macaroni and serve at once.

100 gm (¼ lb) = 190 calories.

Baked Macaroni

Boil 200 gm (1 cupful) of macaroni or nudels in salted water and strain. Butter a pudding dish with butter, put the macaroni or nudels into the dish.

Put 2 eggs and a little salt into ½ pt of milk and ½ pt of cream, mix thoroughly and pour over the nudels or macaroni. Bake in a hot oven for 1¼ to 1½ hours. Serve with meat.

Calories: 300.

Omelet

Beat 3 eggs well and add a little salt. Melt a teaspoonful of fresh butter, put same into an egg pan, pour the eggs into the pan containing the butter and shake it. Keep it over the fire until it thickens and gets a light brown color on one side. Roll the omelet and serve on a hot plate at once.

About 325 calories.

DESSERTS

Boiled Rice

Wash the rice in cold water. Soak it—30 gm (1 oz)—in cold water, add a little soda, and do not use until the next day. Pour off the water, before using the rice. Boil ½ lb (1 pt) of milk, add the rice, cover same and allow it to boil for 1¼ hours on a moderate fire.

If the rice should become too thick from boiling, add a little more milk. Beat the white of an egg until stiff, and just before serving add the white of the egg to the rice. The yolk of an egg may also be added, but before the white has been added.

Total calories: about 700. 100 gm (½ cup): 160 calories.

Boiled Tapioca

Boil 20 gm (¾ oz) of tapioca in ¼ lb (½ pt) of milk for ¼ hour, stirring constantly. Then prepare like rice. Farina can also be prepared in the same way.

About 270 calories.

Flour Pap

Mix 15 gm (½ oz) of powdered wheat flour with 3 tablespoonfuls of cold milk until smooth. Boil ¼ lb (½ pt) of milk, add the flour and boil for 10 minutes, stirring constantly. If it thickens too much, add a little more hot milk. The rest of the preparation is just as for rice.

Calories: about 250.

Apple Sauce

One glass of white wine, sugar to taste, 15 gm (½ oz) of gelatin are dissolved in hot water and mixed with 250 gm (1 cup) of apple sauce, poured into a mould which has previously been rinsed with cold water.

Tapioca Pudding

Boil 35 gm (1⅛ oz) of tapioca with ¼ lb (⅛ pt) for about ½ hour, until it thickens. Then let cool a little. Beat to a

cream 25 gm (¾ oz) of butter, add the yolk of 2 eggs and 1 tablespoonful of granulated sugar, all to be mixed with the tapioca. Beat the whites of 2 eggs until stiff, and add.

Butter a pudding dish and pour the whole into it. Bake in a well heated oven for ½ hour.

100 gm (½ cup) = 175 calories.

Sponge Pudding

Melt 20 gm (¾ oz) of butter in a saucepan. Thoroughly mix 50 gm (1¾ oz) of flour and ¼ lb (½ pt) of milk, boil in the saucepan containing the melted butter. Let the mixture cool off and then add the yolk of 1 egg.

Beat to a cream 20 gm (¾ oz) of butter and yolks of 2 eggs, 1 tablespoonful of sugar, a little vanilla, and add to above.

Beat stiff the whites of 3 eggs and add.

Butter a pudding dish, dust same with bread-crumbs, put the entire batter into the pudding dish and allow to steam for 1 hour.

100 gm (3¼ oz) = about 220 calories.

A vanilla or wine sauce may be served with this pudding. The pudding can also be baked, if so desired.

Rice Pudding

Soak overnight 35 gm (1⅛ oz) of rice in cold water. Next day boil ½ pt of milk, add the rice, cover same and cook slowly until soft.

Beat to a cream 25 gm (¾ oz) of butter, add yolks of 2 eggs, 1 tablespoonful of sugar, add to the rice while it is still lukewarm.

Beat the whites of 2 eggs and add to the above. Pour into a buttered pudding dish and bake for ½ hour.

100 gm (½ cupful) = 150 calories.

Biscuit Pudding

Add ¼ lb of powdered sugar to the yolks of 5 eggs and beat well for about ½ hour.

Mix 1 tablespoonful of flour, a little vanilla, 1 tablespoonful of

arrack or cognac with the beaten whites of the above 5 eggs, and add to the above.

Butter a pudding dish, dust with bread-crumbs, put the whole into the pudding dish and steam for 1 hour.

100 gm (½ cupful) = 215 calories.

Noodle Pudding

Boil 70 gm (2¼ oz) of thread noodles, crumble them into ½ lb (1 pt) of boiling milk and boil for ½ hour.

Beat to a cream 50 gm (1¾ oz) butter, add the yolks of 3 eggs, 1 tablespoonful of granulated sugar, add to the noodles which have been put aside to cool.

Beat the whites of the 3 eggs and add to the above.

Put the whole into a buttered pudding dish and bake in an oven for about 1 hour.

Chocolate Pudding

Scald 125 gm (3¾ oz) of zwieback with ¼ lb (½ pt) of milk. Add 100 gm (a little less than ¼ lb) of grated chocolate; mix all together.

Beat to a cream the yolks of 7 eggs and 7 tablespoonfuls of granulated sugar, and add to the above.

Beat stiff the whites of the 7 eggs and also add. Steam for 1 hour. Vanilla sauce can be served with this pudding. This portion is for 4 persons.

Omelet Soufflée

Beat the yolk of 1 egg and 1 tablespoonful of granulated sugar for ¼ hour. Add a pinch of flour, 1 tablespoonful of arrack and the whites of 1½ eggs, beaten stiff.

Put 5 gm (⅛ oz) into an omelet pan and melt. Heat a soup plate which will fit the pan exactly. Put the mixture into the pan and cover with the hot plate. Bake the omelet over a moderate fire for 4 to 5 minutes, put it on a heated flat plate, roll it in half and sprinkle with powdered sugar. Serve at once.

Total calories, 240.

Pancakes

Mix well 1 tablespoonful of flour with milk, add yolks of 2 eggs and a little salt. Beat the whites of the 2 eggs and add. Pour into a pan and fry in butter.

Snowballs—Vanilla Cream

Two pts of milk and 1 tablespoonful of granulated sugar are mixed well together and brought to boiling-point.

Take the whites of 4 eggs, add 1 tablespoonful of powdered sugar, and beat until stiff. Dip a spoon into the beaten whites of eggs and drop into the boiling milk, but do not put more than 6 snowballs into the milk at a time. Boil the milk in a large, wide vessel.

After the snowballs have boiled for about 6 minutes, turn them and boil them for another minute. Take the balls carefully out of the milk with a skimmer and put on a large plate. Serve with chocolate sauce.

Calories: 450.

SAUCES AND COMPOTS

Apple Sauce

Peel and core the apples, cut into quarters, add a little water, a little white wine and sugar to taste. Boil until soft and mash thoroughly through a hair sieve.

100 gm (½ cupful) = 75 calories.

Chocolate Sauce

Dissolve 150 gm (¾ cupful) of chocolate in 1 cupful of hot milk, pour into a saucepan. Take 1 teaspoonful of fine wheat flour dissolved in milk-sugar to taste, stir constantly, and add 400 gm (2 cupfuls) of milk and boil until the same begins to thicken.

Calories of chocolate sauce: about 1,200.

Stewed Pears

Peal the pears, cut into halves, add enough water, a little sugar, and boil until soft. A little wine may also be added.

If fresh pears are not in season, use dried pears. Wash the dried pears thoroughly, soak them in warm water for about 3 hours and put them to boil in the same water in which they have been soaked. For sensitive stomachs the pears must be mashed through a sieve.

Prune Compot

Soak the prunes the night before using and cover same. Next morning pour off the water, take out the pits and cut into small pieces. Boil them in a vessel, with water enough to cover them, on a moderately hot fire for 3 to 4 hours. Mash through a sieve and let cool. To enhance its laxative effect, add to a saucer of prunes 1 tablespoonful of sugar of milk dissolved in a little water. Do not put the sugar of milk into the entire quantity of compot so as to prevent fermentation.

Huckleberries

Put 70 gm (2¼ oz) of dried huckleberries into 500 gm (2 tumblerfuls) of cold water, and boil slowly for 3 hours. Strain through a cloth.

Wine Sauce

Put the yolks of 2 eggs into a small casserole with ½ teaspoonful of potato flour, mix thoroughly, add ½ pt of white wine, stir the mixture thoroughly, add 1 to 2 tablespoonfuls of granulated sugar, put on the stove and continue stirring until the mixture thickens; remove from stove at once and cover. Beat the whites of 2 eggs until they are stiff, add the sauce to the whites of eggs and mix slowly. Serve at once.

Calories of the alcohol 100 gm (¾ wineglassful) = 110.

Physical Treatment

Lavage of the Stomach

INDICATIONS

(*a*) Acute poisoning, unless caused by corrosives; acute dilatation of the stomach with paralysis of the stomach musculature caused by acute fermentation, cholera, ileus, tetany, pneumatosis and post-operative paralysis of the stomach musculature.

(*b*) Chronic gastric fermentation, where the motility of the stomach is considerably involved (chronic gastritis, cancer and dilatation of the stomach).

(*c*) Excesssive gastric secretion (one or two lavages are beneficial).

(*d*) Some cases of gastric neurosis, as a suggestive agent.

(*e*) Hemorrhages of the stomach, to introduce ice water or hemostatic medicinal agents (2% liquor ferri sesquichlorati or gelatin), where other agents have failed to arrest the hemorrhage.

CONTRAINDICATIONS

(*a*) Non-compensated cardiac diseases, myocarditis, advanced arteriosclerosis, aneurism, varicose veins of the esophagus (cirrhosis of the liver).

(*b*) Recent hemorrhage in any part of the body.

HOW TO WASH THE STOMACH

The instrumental outfit (Fig. 2) for lavage of the stomach consists of (1) the stomach tube *A*, about 80 centimetres in length, to which is attached, by means of a glass tube *B*, a piece of rubber tubing *C*, about 25 centimetres long; (2) a glass funnel *D*; (3) a graduated glass *F*; (4) *Haynes'* aspirating bulb *E*.[1]

The stomach tube proper should be marked by lines dividing it

[1] In our experience Tiemann & Co.'s stomach tube answers all requirements of a durable instrument.

at distances of 10 centimetres each, in order to be able to localize the position of the tube.

The distance from the teeth to the esophagus is 18 cm, from

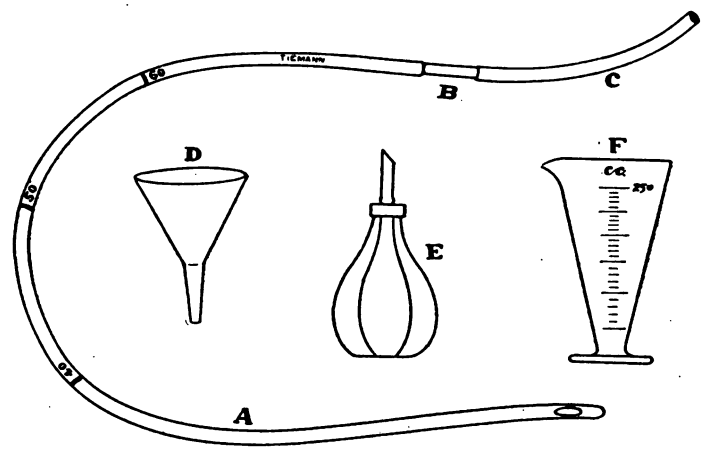

Fig. 2.—Stomach Tube.

the teeth to the cardia 40 cm, and from the teeth to the greater curvature about 50 cm.

Mode of Introduction

Calm patient with a few encouraging remarks; have him hold a basin in his hands to prevent him interfering with your manipulations; remove false teeth, if any; order him to breathe naturally and to sit in an erect position, the head in a straight line with the body; introduce the tube which has been dipped into hot water, ordering the patient to swallow as soon as the tube has reached the posterior wall of the pharynx.

Cocainizing the posterior wall of the pharynx is only required in a few cases of extremely neurotic patients.

Extreme cyanosis, accompanied by coughing, indicates that the tube has slipped into the trachea and must be removed—a very rare occurrence; slight cyanosis with little coughing may be due to the fact that the patient stopped breathing from excitement, and all that is necessary is to remind the patient to breathe naturally and to proceed with our work.

The tube having arrived in the stomach, the patient is instructed

to give a short cough or to press lightly as at stool, placing one hand on the epigastrium ("expression method"). If this method should not be successful, the so-called "aspiration method" with the aid of *Haynes'* bulb has to be resorted to. Now the proper washing of the stomach is proceeded with by attaching the glass funnel to the end of the tube, beginning to pour water into the funnel at a lower level than the stomach, in order to prevent air getting in, and gradually raising it to the full length of the tube.

No more than half a pint should be poured in at each filling, and control exercised to make sure that almost all of the liquid is returned into the "graduated glass."

Clogging of the tube by food particles is overcome by pouring in a little more water. Interrupted outflow is re-established by inserting the tube farther, or withdrawing it, by a few centimetres.

In removing the tube, it is advisable to close the outer end with the finger, so as to keep the liquid in the tube and prevent it from invading the trachea.

Before proceeding with the lavage of the stomach, it is most essential to have the patient empty the contents of the stomach either by "expression" or "aspiration." This will serve a double purpose, viz.: (1) any stagnated food can be examined chemically, macro- and microscopically, thus facilitating the diagnosis; and (2) the lavage is facilitated and shortened by the tube not becoming clogged by particles of food.

The solution to be used for lavage of the stomach will be dealt with in the appropriate chapters when treating of the different forms of gastric diseases; at the present juncture, however, it may be stated that the best time for lavage is in a fasting condition, so as to have the patient utilize all the food he takes in during the day.

Experience has shown that even in patients with disturbed gastric motility and mild forms of stenosis, the stomach is emptied almost completely during the night with the patient lying on his right side.

Only in cases where stagnation of food causes the patient painful, disturbed nights, lavage of the stomach should be done before the patient retires, provided the last meal was light and given at least five hours before the lavage. However, lavage at bedtime will be found necessary for a limited time only in any case.

In carcinoma of the stomach, lavage may be necessary several times daily, in order to give at least some comfort to the patient.

Another most important and well-known use of the stomach tube is for diagnostic purposes, either to remove from the stomach *Ewald's* test-breakfast, which consists of 250 grams of weak tea, without sugar, and 50 grams of white bread, one day old, taken ¾ to 1 hour before it is to be removed, or *Riegel's* test meal, which consists of 150 grams of beef, 200 grams of potatoes, barley soup and bread, removed 3 to 4 hours after ingestion.

The stomach douche, which for some time was thought to be useful for local treatment of the stomach, is to-day generally abandoned.

CLEANSING ENEMATA (IRRIGATION OF THE INTESTINE) AND NUTRITIVE ENEMATA

Cleansing Enemata

Indications.—Acute or chronic stagnation of fecal matter (coprostasis); also when accompanied by colicky pains; furthermore, acute inflammation of the bowels, especially when associated with putrefaction (typhoid, dysentery, cholera, auto-intoxication). Ileus.

The most important indication for irrigation of the intestine has always been chronic constipation.

The apparatus generally used for irrigation is a fountain syringe. A cleaner appliance consists of a funnel with a soft rectal tube attached. The patient assumes a position on his left side when irrigation is applied, with slightly elevated hip, the legs flexed on the thighs and the thighs upon the abdomen.

For low enemas the rectal tube is inserted 6 to 8 cm and the liquid allowed to flow in under low pressure. For high enemas the rectal tube is introduced gradually up to 6 cm; the fluid is then allowed to run in under low pressure, which facilitates the further introduction of the tube to 12 or 15 cm. This method will prevent the tube from kinking.

The quantity used in low enemas is about ½ to 1 quart at temperature of from 100° to 102° F., allowing it to stay for about

fifteen minutes; if it remains for a much longer period, the water will be absorbed and the desired effect lost.

For higher enemas, larger quantities of from 1 to 1½ quarts are used for the same length of time and at the same temperature, except in catarrhal jaundice. In the latter affection *Krull*[2] recommends the following method which has proved successful: Initial temperature of the water 50° F., to be kept up for a few successive days and then gradually increased to 60° F. The quantity of 1 to 2 quarts to be retained by the patient as long as possible.

Cold high enemas are also indicated in intestinal hemorrhage of all sources; they have been especially advocated by *F. Klemperer* for hemorrhages in typhoid fever.

High enemas will reach and even pass beyond the Bauhinian (ileocecal) valve by quantities amounting to 5 or 6 quarts, as shown by the X-ray.

The solution usually used for intestinal irrigation is normal saline solution (1 teaspoonful of salt to a pint of water), or soap, oil, glycerin or epsom salts, oxgall, etc., is added according to the effect desired.

An interrupted flow is restored by moving the rectal tube slightly forward and backward.

Should the patient experience marked discomfort while the enema is given, and should he try to expel it, simple interruption of the flow by pressing the tube with index finger and thumb for a few seconds will overcome the difficulty.

As a matter of course, the rectal tube should be greased before insertion; it is likewise important to observe that the air is expelled from the tube. Where daily irrigations are made, the quantities should not exceed a pint at a time.

Direction for preparing enemas most commonly used:

Normal saline: 1 teaspoonful of sodium chloride to the pint of water at the temperature of 100 to 102° F.

The so-called S.S. enema consists of the above-named normal saline plus soapsuds. It is more effective in constipation.

Oxgall enema consists of a teaspoonful of oxgall to the pint of water, at the temperature of 100 to 102° F.

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[2] Berl. klin. Wochensch., 1877. No. 12.

The *Hare* enema consists of

Epsom-salt	1 tablespoonful
Glycerin	1 ounce
Water (at a temp. 100° to 102°)	2 quarts

Carminative enema: camomile tea, 2 teaspoonfuls to a pint of boiling water to be made as an infusion, strained, injected at the temperature of 100 to 105° F., to be retained as long as possible.

Medicated enemata are described below.

Injection of oil, which was first advocated by *Kussmaul* and later more extensively introduced by *Fleiner* and others, has proved very satisfactory in various affections of the intestine, chiefly in chronic constipation of the spastic and also of the atonic type. In the latter affection oil injections are especially useful in patients who are victims of the laxative habit, as the oil, if properly used, will overcome it. According to our experience, even obstinate cases of constipation have been cured by the oil treatment in a comparatively short time.

According to *Hemmeter* [3] and other authors, a very important indication for oil treatment is colica mucosa. Other indications will be mentioned in the appropriate chapters.

The apparatus (Fig. 3) for administering oil enemas consists of a rectal tube, *A*, connected by means of a glass tube, *B*, with a piece of rubber tubing, *C*, about 25 cm long, and a glass funnel, *D*, which is attached to the outer end.

Another device, recommended by the author of this book, is a solid metal syringe holding about 300 grams of oil, with a rectal tube attached to the nozzle.

These two methods, although excellent, require the aid of another person, but one of us has devised a method which enables a patient to use an oil enema without assistance. It consists of an ordinary bulb syringe (Fig. 3, *E*), with a capacity of half a pint, which is connected with a rectal tube.

Whatever syringe is used, it is important that immediately after application it should be cleansed with soap water, followed by alcohol.

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[3] Disease of the Intestines, Philadelphia, 1904, Vol. 1.

Method of Use.—Mattress and linen are protected by a rubber sheet. The patient lies on his left side, with the head lower than the body. The thighs are flexed on the abdomen and the legs on the thighs.

The rectal tube, filled with oil, is slowly introduced to about 5 cm, and while the oil begins to flow in, the tube is pushed higher to about 10 or 12 cm. The oil being all in, the rectal tube is withdrawn and compressed with the fingers to prevent soiling. The patient remains on his left side for at least twenty minutes longer

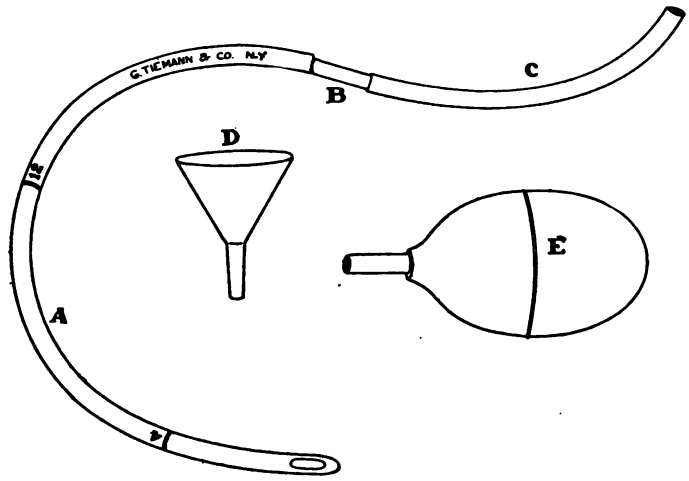

FIG. 3.—Rectal Tube.

and is instructed to retain the oil all night. As a rule, this is easily accomplished, but when in some rare cases the patient is disturbed during the night on account of the oil, the subsequent enemas may be given in the morning and the patient told to hold the oil for 3 to 4 hours.

If the movements after the first enemas are not followed by sufficient evacuations, or if the oil alone is expelled, the patient should be given a low soapsud enema while at stool, the quantity not to exceed half a pint. Sometimes a glycerin suppository will suffice.

The temperature of the oil should be 100° F., and the best way to heat the oil is to pour the required quantity in a glass tumbler and heat it in a water bath.

The best oil to be used is pure olive oil, which, as a rule, will give no discomfort. At times, however, the fatty acid in the oil may, according to *Hemmeter* and *Rosenheim*, cause some intestinal irritation, and according to the former author this may be overcome by shaking the oil up with hot water, as the latter takes up the fatty acid. *Rosenheim* adds bicarbonate of soda (4:250) and, by shaking, neutralizes the fatty acid. As a fairly good substitute, linseed oil may be used, especially where expense is a factor.

The quantity should be at first half a pint and then decreased as the desired effect is obtained.

The frequency of the oil injections depends upon the indication, and will be dealt with under the proper headings.

Patients taking the oil cure for some length of time experience an oily taste in the mouth, and *Loewe*[4] has found in experiments on cats that oil introduced by the rectum was found in the stomach.

The beneficial effect of the oil is due to soothing the irritable mucous membrane of the intestines and, according to *Einhorn*, to preventing spasms by keeping the large intestine filled, and to its nutritive property, as part of it is absorbed.

Oil injections are also beneficial in gallstone cases, where patients cannot take oil by the mouth.

Recently *Lipowski*,[5] of Berlin, recommended the use of liquid paraffin instead of oil, liquefying it before use in a hot-water bath of 103° F. and injecting a quantity of half a pint by a syringe of that capacity.[6]

Enemas of glycerin (1½ tablespoonfuls) are effective when fecal masses are lodged in the rectum. They cannot, however, be continued for any great length of time owing to their irritation, which may cause dizziness and nausea in nervous patients.

In certain intestinal conditions the addition of drugs to enemas is indicated either for their astringent or disinfectant properties. As astringents are used tannin, 5:2000; liquor ferri sesquichlor., 1:1000; argent. nitrici, 0.4:250; and albargin, 0.1 to 0.3:1000. As disinfectants are used naphthol, 1:1000; salicylic acid, 2:1000;

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[4] Zeitsch. f. klin. Med., 1903, Vol. L.

[5] Berl. klin. Woch., 1909, 29; Münch. med. Wochensch., 1910, 50.

[6] Bendiner & Schlesinger, New York, put up the proper mixture in accordance with *Lipowski's* directions.

chinini mur., 1:1000; lysol, 0.5:1000. In bleeding of intestines, gelatin, 50:250. In flatulence and mild intestinal colic, infusion of camomile tea, 15:500.

The use of any of the above drugs, except camomile, is to be preceded by a cleansing enema, and if the bowels are irritable, it is well to add 10 to 15 drops of tincture of opium to the enema.

Another indication for adding drugs to the enema is when there are reasons for not administering them by mouth.

High hot rectal enemas very often render good service in certain forms of chronic diarrhea.

(*b*) *Nutritive Enemata*

By nutritive enemas are understood injections of nutritive solutions in appropriate combinations, so that a certain percentage may be absorbed in the large intestines. How this absorption is brought about has been made clear by the experiments of *P. Grützner*,[7] who showed not only in animals, but also in man, that a peripheral antiperistaltic wave takes place in the intestine when certain nutritive substances, mixed with sodium chloride, are injected into the rectum, by which the food is transmitted into the stomach. These experiments were confirmed by *Hemmeter*[8] and *Bernheim*.[9] However, it should not be forgotten that the greater part is absorbed from the intestine.

While it is essential to add a certain percentage of salt to all nutritive enemas, *Ewald* and *Strauss*[10] have shown that the addition of a 20% solution of grape-sugar likewise assisted absorption.

In the majority of cases nutritive enemas cannot be tolerated for any length of time, as they irritate the rectum, cause flatulence, tenesmus and diarrhea. Sometimes the first injection already causes irritation, and in that case 10 to 15 drops of tincture of opium should be added to subsequent injections.

One cleansing enema should always precede the first rectal feeding, and it depends upon the individual case how often the latter will have to be repeated.

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[7] Deutsche med. Wochensch., 1894, 48.
[8] Arch. f. Verdauungskr., 1902.
[9] J. A. M. A., 1901, Feb. 16.
[10] Charité Ann., 1897.

Experiments have established the fact that to a certain extent proteids, fats and carbohydrates can be absorbed by the colon, provided that the ingredients be given in an absorbable form and be predigested with the corresponding ferments. The absorption of fat, which is the most refractory of these substances, is facilitated by the addition of pancreatin and sodium chloride and, with this object in view, *Friedmann* and *Strauss* [11] advise the following "cream enema":

1 pint of cream
1 teaspoonful of pancreatin
About 2 tablespoonsful of pepton
About 2 tablespoonsful of grape-sugar
½ teaspoonful of salt

Alcohol is also quickly absorbed by the rectum, but in hyperchlorhydria it may reflexly stimulate secretion of HCl in the stomach even if administered per rectum.

The most important formulæ for rectal feeding are the following:

Boas: ½ pint of milk
2 egg yolks
1 tablespoonful of red wine
1 tablespoonful of a thin flour (Nestlé's, Mellin's)

Riegel: ½ pint of milk
2 to 3 eggs
½ teaspoonful of salt
1 to 2 tablespoonsful of red wine

Ewald: 3 to 5 eggs
5 oz of a 15% grape-sugar solution

The resorptive power of the intestine, with 3 to 4 nutritive enemas daily, is unable to supply more than 200 to 500 calories, hence a starvation diet at best.

Another mode of rectal feeding is the drop method, analogous to the *Murphy* drop method of normal saline. It is given in the shape of hot milk to be absorbed in drops. In this way as much as a quart of milk, and even more, can be retained and absorbed.

[11] Therapie d. Gegenw., May, 1911.

Indications for rectal feeding are conditions in which the entrance of the food into the stomach, or its passing out from the stomach, is obstructed (stenosis of the esophagus, cardia or pylorus), and exaggerated motor insufficiency; furthermore, gastric disturbances which demand absolute rest for the stomach for a prolonged time (hemorrhages from the stomach, acute vomiting as in uremia, pregnancy, acute gastritis and corrosive poisoning).

These indications will be referred to again in greater detail when dealing with the therapy of gastro-intestinal diseases.

W. Kausch reports good results from subcutaneous injection of a 2 to 5% solution of grape-sugar in normal salt solution, and still better results from intravenous infusion of a 5 to 10% solution of grape-sugar in normal salt solution, in peritonitis and after operations, hemorrhages, etc.

MASSAGE

Gastric Massage

The two physical methods of treatment, namely massage and electricity, while being of some value in functional gastro-intestinal disorders, especially atonic constipation, we personally would advise rather to be cautious with their application, as in organic diseases they may be really harmful.

For the sake of completeness, however, we deem it proper to give a short description of the use of the methods.

Indications.—Motor disturbance of the stomach due to atony of the musculature; pyloric stenosis of moderate degree; insufficient gastric secretion and chronic gastric catarrh; gastroptosis; pressure in the stomach of nervous origin.

Contraindications.—Fresh hemorrhages; gastric fermentation with marked distention; perigastritis; cholelithiasis; nervous hyperacidity.

Massage is instituted on an empty stomach, if the intention is to strengthen the musculature of the stomach and to increase the blood supply to the gastric mucosa. It is instituted on a full stomach, preferably three hours after a meal, if the intention is to empty the stomach.

Technique of Massage on an Empty Stomach.—The patient lies flat on his back, with legs slightly flexed. The masseur stands on the right side of the patient, grasps with his left hand deeply behind the left costal arch, while his right hand is placed upon the left one in order to increase the pressure. Circular motions are executed under continuous gentle pressure, the hands gradually advancing from the fundus to the pylorus. While so engaged, vibratory movements of varying strength are made with the finger-tips to exert a deep effect, accompanied by kneading movements between the thumb and fingers of the right hand. A few stroking movements from left to right complete the procedure.

If massage is done on a full stomach with the intention of promoting the evacuation of the organ, of rapidly increasing the secretion of the juice and of thoroughly increasing the gastric contents, the kneading movements should be very deep and the stroking movements should go from right to left, the patient occupying a semi-lateral position on his right side.

Intestinal Massage

Indications.—Chronic constipation due either to atony of the intestinal musculature or to atrophy of the muscles of the abdominal walls (pendulous abdomen); excessive adipose tissue of the abdominal walls; *Glenhard's* disease and *Stiller's* habitus in young individuals.

Atony, whether due to a catarrhal condition of the large intestine or to faulty innervation, has often been benefited by massage. Its usefulness in atonic constipation consists in improving the circulation of the intestinal and abdominal muscles and in exciting direct and reflex stimulation of the nerve pluxus of the intestines.

Contraindications.—Spastic constipation, enteritis membranacea, chronic appendicitis, suspected ulceration of the gastro-intestinal tract, cholecystitis, arteriosclerosis.

Technique.—In deciding upon the technique of abdominal massage, the condition of the adipose tissue, the resistance of the musculature and the susceptibility of the patient should be taken into consideration. In irritable individuals the abdominal muscles undergo a reflex contraction upon energetic manipulation and prevent

very deep pressure upon the abdominal walls. In these cases massage while taking a bath would commend itself owing to the complete relaxation of the muscles, but external difficulties would prevent such a procedure. The thermophore, however, exerts the same effect in some cases. Attempting massage with a cold hand would immediately have the opposite effect and should therefore be strictly avoided. It is rather advisable to accustom the patient to the touch of the hand by gentle rubbing and stroking, to request him to keep his mouth half open, to breathe quietly, to distract his attention and to impress upon him not to talk or to raise his head. The position he should occupy has been described above.

The manipulations differ with various authors. *Reibmayer* describes the following five methods: Circular movements around the umbilicus with the finger-tips; similar movements, but more extensive, with the palmar surface of the hand, simultaneously exerting pressure with the thumb and the ball of the little finger; stroking with both superposed hands with the finger-tips downward along the ascending colon, from the right downward and inward toward the right upward and outward; stroking in a similar way along the descending colon and sigmoid flexure, but with the finger-tips directed upward; thorough kneading of the entire abdominal wall and deeply pressing into the abdomen.

Kümmerling describes the following method, which is rather aggressive, but distinctly effective. The seat of the stagnation, which is usually in the sigmoid, having been established, the patient is placed in the right decubitus so as to render the descending branch of the large intestine conveniently accessible. The epidermis and adipose layer are carefully lifted with the thumb and index finger of both hands until access to the gut has been gained. The corresponding places of the latter are manipulated with the finger-tips of both hands, executing sawing and pushing movement as the hands advance from above downward. This is frequently painful. The manipulations having lasted for about five minutes, the patient is placed in the left decubitus, the operator standing at his back and repeating the same procedure with the cecum and ascending colon, advancing of course from below upward. This will leave the transverse colon and the entire tract of the small intestine still to be manipulated, and for this purpose the patient is to assume the knee-elbow

position. The abdominal walls being now completely relaxed, the operator has an opportunity to work upon these parts with rhythmic pushing movements with the finger-tips of both hands or, if there is considerable adipose tissue, even with his clenched fists. The abdominal massage should not occupy more than 15 minutes.

No undue force should be used.

In important cases where the physician cannot personally attend to the regular procedure, *Sahli* recommends the use of an iron ball covered with cloth and weighing between 3 and 5 pounds. The patient can use the ball himself by rolling it over his abdomen for 10 to 15 minutes while in bed and following the tract of the large intestine.

ELECTRICAL TREATMENT OF STOMACH AND INTESTINE

Electricity may be applied either intra- or extraventricularly. In the extraventricular method two large flat disk electrodes of different sizes are used, the larger one to be applied to the anterior abdominal wall in the direction from the pylorus to the fundus, and the smaller one from the fundus to the vertebral column in such a way that the distance between the peripheries of both electrodes will not exceed 2 cm.

The intraventricular method was first recommended by *Duchennes* and *Kussmaul*. *Einhorn* devised a method of using intraventricular electricity, in which the patient has to swallow an electrode in the shape of a hard button—the negative pole—while the positive pole is placed on the abdomen.

The author of this book, not being satisfied with the various methods, devised a new electrode in 1895,[14] an improvement of which was brought out by him in 1901.[15] It excels by great simplicity and has other advantages. The electrode itself consists of a flexible and elastic wire (not a spiral) with a disk as a head-piece and a small knob at the other end. The wire carries a sliding duplex screw binding post (see illustration). One of the screws serves to fix the

[14] Ther. Monatsh., April, 1895.

[15] Ther. Monatsh., Aug., 1901.

slide in position at any desired point on the wire, while the other receives the conducting wire leading to the electric battery.

The procedure is as follows: Before inserting an ordinary stomach tube, exact measurement is taken how far the wire may be introduced into the pharyngeal tube (with glass connecting piece) so that the button electrode will be about 1 cm above the lateral or central apertures with which the stomach tube is provided. In this way the wire cannot protrude beyond the tube and cause injury. At this point the slide is fixed by means of one of the screws. The soft stomach tube without the wire is now swallowed and salt solution poured in by means of a funnel. If necessary, the stomach is washed out. The funnel tube is removed, the wire which has been previously marked is introduced. This is easily accomplished, if the head is slightly bent back. The disk electrode is placed over the stomach, and both electrodes are connected with the battery. When the sitting is over, the wire is removed first, and then the pharyngeal tube. The button electrode may be pulled through the slide for cleansing purposes. All parts should be well dried and protected from moisture, although, being heavily silver-plated, they are well protected from rust.

The advantage of this method consists in the fact that the electrode may be inserted through a soft stomach tube, that water may be poured in, the stomach washed out, electricity supplied and the water withdrawn from the stomach, without changing the tube.

Indications: Gastroptosis, neurosis of the stomach.

Intestinal electrification may also be applied in a twofold manner, viz., by the abdominal and recto-abdominal methods. In the abdominal method the negative disk electrode is applied to the lumbar region and a movable plate over the abdomen. In the recto-abdominal method one electrode is inserted into the rectum for 10 to 12 cm and the other over the abdominal wall.

While it was necessary to mention the treatment by electricity, it should be added that, generally speaking, it is not a desirable one for three reasons: (1) It has not been a success in intraventricular and intraintestinal application owing to its impracticability; (2) its indications are extremely limited; (3) it can only be considered a suggestive method at best.

ORTHOPEDIC TREATMENT

By orthopedic treatment is understood the application of a support to the abdomen for the purpose of compensating the tone of the abdominal musculature and restoring the displaced organs to their normal position. This object is not accomplished by flannel bandages commonly used by the laity, as they will not do more than afford protection from temperature changes.

In pendulous abdomen with weakness of the abdominal musculature, and enteroptosis, appliances are used which will either exert

FIG. 4.—Abdominal Supporter.

pressure in a certain direction or merely keep the abdominal organs in place as a substitute for the lost elasticity.

The pad so commonly used to keep a floating kidney in position does not produce the desired effect, while an ordinary elastic bandage worn as a general support will also keep the kidney in place. All appliances will do the most good in individuals with prominent abdomen, while in lean persons with retracted abdomen (asthenic enteroptosis) these supports will not fully serve their purpose. Such patients should be built up by the *Weir-Mitchell* rest cure.

As a preliminary to abdominal bandages it is advisable to apply a zinc-oxid adhesive plaster according to the method devised by *A. Rose*. This plaster is 40 to 50 cm long and 10 to 12 cm wide. In enteroptosis, if unilateral, it is applied over one side; if bilateral, over both sides. The plaster is started from under the umbilicus in

the form of a spiral around the hypochondrium back to the spine, at the lower dorsal vertebra, and the plaster is then left undisturbed for 2 to 3 weeks. In many cases, however, the elastic bandage may be applied without resorting to the preliminary adhesive plaster.

In order to overcome the inconvenience of the bandage shifting up and down, it is advisable to provide a suspenderlike arrangement above and thigh straps below, as shown in the accompanying figure (Fig. 4).

TREATMENT BY GYMNASTICS

To influence the gastro-intestinal tract, the following gymnastics have been advised: Raising of the trunk, from a horizontal position, without support of arms; elevating stretched legs in horizontal position; rotatory motions of the trunk in a sitting position; bending of the trunk forward in standing position; knee flexions. Other gymnastics are swimming, horseback riding, rowing, tennis, and bicycle riding.

Indications.—General lack of muscular tone, but with perfectly healthy organs; atonic constipation; nervous dyspepsia. It is essential that the general condition of the patient, particularly the circulatory system, should be taken into consideration before gymnastics are ordered. In under-nourished individuals, we should first feed them up, then begin with passive movements, then short walks, before active exercises are proceeded with.

HYDROTHERAPEUTIC MEASURES [16]

Hydrotherapeutics can be divided into general and local. It does not only exert a good influence on the general system, but also on the gastro-intestinal tract.

It should be borne in mind that in people suffering from gastro-intestinal disease, who have usually low resisting power, the milder hydrotherapeutic procedures are indicated. Not only are functional gastro-intestinal diseases favorably influenced by hydrotherapy, but pains resulting from organic disease are often benefited.

Hydrotherapeutic procedures may either stimulate or soothe the

[16] Cf. Dieffenbach: "Hydrotherapy," Rebman Company, New York.

general organism, depending on the temperature of the water and the method of its application. Its object is to influence circulation either by directly stimulating the cutaneous nerves, by reflex stimulation of the central nervous system, or by influencing the general condition of the patient.

Among the general hydrotherapeutic measures, wet friction may be mentioned first. It may be rendered more stimulating according to the degree of temperature applied, and is best had in the morning upon arising in order to utilize the contrast of the bed temperature. A bed sheet is soaked in water at a temperature of 86° to 72° F., and wrung out; it is then thrown over the patient from behind. While the latter rubs his chest and abdomen, the attendant applies vigorous friction to the back and extremities until all sensation of cold has disappeared. The wet sheet is removed and the patient rubbed warm with a dry cloth, after which he returns to bed or takes a walk before sitting down to breakfast. The initial temperature should be 86° F., and then reduced every other day by 1° down to 72°. In very sensitive patients friction may be replaced by tempered ablutions or partial ablutions with water and alcohol in the proportion of 2:1.

General spray or ray douches of low temperature should be avoided in irritable or anemic patients with undeveloped adipose tissue, as otherwise their nervous irritation may be increased. For patients of this category, full baths at 90° to 92° F., and of 10 minutes' duration, are preferable, followed by a cool douche or ablution of 72° F. These baths can be rendered more refreshing and stimulating by slowly lowering the temperature by 2° to 4°, the patient carrying out movements so as to prevent chilling.

A very favorable and moderately stimulating effect upon the nervous system may be obtained by modified half-baths in the following manner: The patient sits in a warm bath of 83° to 88° F. for 5 to 10 minutes: the attendant lets the water escape down to the umbilicus and pours a pailful of water of 72° to 79° F. in three portions over the patient from behind without wetting the head, applying friction in the intervals with the palm of his hand and rubbing him dry. This completes the procedure. *Strasser* [17] rec-

[17] Blätter f. klin. Hydrother., 1895, 5.

ommends shorter and cooler half-baths at 63° to 65° F. of about 3 minutes' duration under vigorous friction. A similar effect is produced by packing the patient in wet sheets and woollen blankets, followed by a douche, friction or a half-bath. A short swimming bath of 3 minutes' duration may benefit nervous dyspeptics.

Local application of water in the shape of bandages, douches and sitz baths come in for consideration in certain gastro-intestinal affections. Moist *Priessnitz* bandages, for instance, have long been used by the general public to relieve various digestive complaints. According to the temperature employed they exert either a rapid or slow irritation upon the abdominal skin, producing by hyperemia of the parts a soothing relief and imparting to the whole body a grateful sensation of warmth. A towel folded into several layers, or a corresponding large piece of felt, soaked in water of 77° to 59° F., is placed over the abdomen, covered with flannel and firmly fixed with a wide flannel bandage. In the case of patients with defective reaction of the cutaneous vessels who will not respond to the warming effect, it is well to insert a layer of gutta-percha paper. Unless there are indications to the contrary, *Priessnitz* bandages are best applied in the evening and allowed to remain overnight. On arising, the abdomen is first subjected to cold friction with a cold, wet towel, and then rubbed dry. Not infrequently these bandages exert a soporific effect.

In painful abdominal affections, in chronic inflammatory and ulcerative processes, hot compresses, either dry or moist, are indicated, as they produce a deeper effect. For this purpose hot cloths, hot plates wrapped in serviettes, cataplasms or poultices are employed. *Von Leube* was the first to introduce hot poultices for the treatment of gastric ulcer; they are decidedly efficacious, although their action is not yet quite explained. He prepares the same with an alcohol stove in which the compresses, filled with cooked linseed meal, swell up by the action of steam without their being soaked with water. A poultice of this kind requires changing every 20 to 30 minutes. Bottles made of tin or rubber, or thermophores, are more convenient to handle, rubber bottles deserving the preference as they adapt themselves to any curve. By interposing a wet cloth, they can be changed into moist, warm compresses, but will not exert the deep effect of hot poultices, which frequently burn the skin.

W. Winternitz [18] recommends in gastric pains of any kind a wet compress enveloped in a dry cloth and surrounded by several turns of rubber tubing in which hot water of 113° F. circulates. He claims better results for this arrangement than for hot compresses. *Kroenig* has constructed a similar apparatus, which has the advantage of uniformly controlling the temperature.

Local douches on the abdomen may be applied in the shape of a movable fan douche or a Scottish douche. The latter is applied for a few minutes at alternating degrees of temperature of 95° and 50° F., the object being to excite reflex contraction of the abdominal musculature and gastro-intestinal peristalsis. *Rosenthal* and *Boas* apply it in dyspeptics with pneumatosis, and *Hühnerfauth* recommends it to increase the motility of the intestines.

Cold sitz baths, of about 55° F. and of short duration (from 3 to 8 minutes), are given to advantage in chronic constipation of obese patients, for hemorrhoids and in plethora abdominalis. They are taken once or twice daily, followed by friction or physical exercise. In anemic and lean patients warmer sitz baths of 95° to 89° F., lasting 10, 15 or 20 minutes, are employed for spastic abdominal conditions (spastic obstipation, chronic diarrhea, enteritis membranacea). The patients are only superficially dried, wrapped up in a friction cloth and ordered to rest in bed.

Bergmann [19] prescribes a warm sitz bath of 82° to 86° F. in the evening. The patient is not dried, and is packed into a moist T-bandage (cross packing), which remains in place overnight. In the following morning a short sitz bath, of a temperature not exceeding 63° F., is taken for 5 to 10 minutes, followed by rest in bed to regain the lost body heat.

Major hydrotherapeutic measures require, perhaps, more than any other therapeutic proceeding a wide range of experience and careful individualization, and experienced attendance by trained nurses, but with these provisions they may well be carried out at home. Nevertheless, the majority of cases will have to be treated in sanatoria chiefly, owing to combination of the treatment with other therapeutic measures, the desirable abstention from business and the advantage of the personal supervision by the physician.

[18] Blätter f. klin. Hydrother., 1891: "Ein neues Magenmittel."
[19] Deutsche med. Wochensch., 1898, No. 35.

Special indications for hydrotherapeutic measures in digestive disturbances are in the first place the various forms of gastro-intestinal neurosis and nervous dyspepsia.[20] Gastric neurosis of both the secretory and psychic description may be favorably influenced by local and general measures which will be discussed in the chapters on special therapy. Another indication is intestinal atony, being usually caused by disturbed innervation. Chronic diarrhea may under certain circumstances yield to this therapy. In the treatment of hemorrhoids both warm and cold sitz baths should be considered. Balneological treatment, which, strictly speaking, is part of hydrotherapy, will be dealt with in a later chapter under the heading of "Adjuvant Methods of Treatment."

Medicinal Treatment of Digestive Diseases

THE EFFECT OF ALKALIES AND THEIR INDICATIONS AND CONTRAINDICATIONS

The views of authors still vary as to the effect of alkalies upon digestion. According to *Jaworski*,[21] small doses (1 to 2 grams) of Karlsbad Sprudel salt or bicarbonate of soda would first decrease acidity for a short time and then increase it. If, on the other hand, large doses (5 to 10 grams) of the above-named salts are taken for a sufficiently long time, the decreasing effect would persist without interfering with the motor function of the stomach. As the salt enters the duodenum, the secretion of bile increases, and when larger doses are taken, the intestinal contents are liquefied and peristalsis is increased.

The alkalies, when given in small or large doses immediately before or with the meals, tend to increase acidity and the gastric secretion. Waters containing alkaline salts like those of Karlsbad, Saratoga, etc., when taken warm, and one hour before meals for 4 or 5 weeks, tend to decrease secretion and have the effect of a stomach lavage, while the temperature of the water exerts a favorable influence upon the sensitiveness of the stomach.

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[20] *J. Sadger*, Arch. f. Vardauungskr., Vol. XII.

[21] Deutsch. Arch. f. klin. Med., Vol. 37 and "Untersuchungen über das Verhalten der M. Fluss-Ströme unter dem Einfluss des Karlsbader Quellsalzes," in Wiener med. Wochensch., 1826, No. 6.

The mineral waters have no ill effect on the gastric motility or ferments; they only increase gastric secretion and decrease the production of hydrochloric acid. In nervous dyspepsia, the mineral waters of the different spas have a depressing effect upon the secretion and the motor function of the stomach.

The properties of the different alkalies may be summarized as follows: Bicarbonate of soda, while decreasing acidity, gives off carbon dioxide in the stomach, causing distention, which is often an undesirable effect. Magnesia ustæ will neutralize acidity in smaller doses than bicarbonate of soda without causing distention, and at the same time it has a laxative effect. It should be mentioned that magnesia ustæ, in large doses and taken for a long time, has been reported to accumulate in the intestines, forming concrements. Calcium carbonate has an antidiarrheal effect. Natrium citricum, in teaspoonful doses, has, according to *Boas*, a strong antacid effect. Experience teaches that when 2 or 3 of these alkalies are combined, smaller doses will suffice to bring about the same result.

Recently, H_2O_2, in the form of magnesia perhydrol tablets (*Merck*) have been recommended as antacid in gastrorrhea; it seems, however, that it has no alkaline properties, but increases the secretion by working directly on the gastric mucosa. *Walbaum* [22] showed that ptyalin and rennin are destroyed by hydrogen peroxide, while trypsin and pepsin are not influenced.

A few combinations of the alkalies, as used with other drugs in various forms of hyperacidity, may serve as examples:

(1) Magnes. ustæ,
Natrii bicarb.,
Calcar. carbon., } āā..... 20.0
Extr. belladonna ..... 0.3 to gr. v
Mf. pulv. ad scatulam.
S. One teaspoonful (heaping) 2 hours after meals (for hyperacidity).

(2) Magnes. ustæ,
Natrii citrici, } āā..... 15.0 to drams iv
Extr. belladonnæ ..... 0.1–0.2 to gr. ii–iii
Mf. pulv. (*Boas*).
S. One teaspoonful 1 to 2 hours after meals.

[22] Berl. klin. Wochensch., 1911, No. 43.

℞ (3) Magnes. ustæ, Pulv. rad. Rhei, āā..... 5.0 to gr. lxxv
Natrii bicarb., Sacch. lactis, āā..... 20.0 to 5 drams
Mf. pulv.
S. One teaspoonful after meals.

℞ 4) Magnes. ustæ ..... 15.0 to drams iiiss.
Bism. subnitr., Natrii carbon., āā..... 5.0 to gr. lxxv
Extr. belladonnæ, Extr. strychn., āā..... 0.1–0.2 to gr. ii–iii
S. One teaspoonful ½ hour after meals (*Boas*).

℞ (5) Magnes. ustæ, Natrii bicarb., āā..... 5.0 to gr. lxxv
Kalii carbon. ..... 3.0 to gr. xlv
Extr. bellad. ..... 0.35 to gr. vi
Mf. pulv.
S. One-half teaspoonful several times daily, ½ hour after meals (*Rosenheim*).

(6) Natrii bicarb., Cretæ albæ, Magnes. carbon., āā..... 0.2 to gr. iiiss.
Dent. tal. dos. No. XV.
S. One before meals in water.

Karlsbad salts are in the market as natural Karlsbad Sprudel salts and artificial Karlsbad salts. Their composition is about the same as shown below:

	Natr. sul.	Kal. sul.	Nat. bic.	Nat. chlor.
Natural	41.6%	3.3%	36.1%	18.1%
Artificial	44.0%	2.0%	36.0%	18.0%

These salts are given in teaspoonful doses in ½ pint of water at a temperature of 90° to 120° F., one hour before breakfast. Like the alkalies, they are indicated in chronic hyperacidity, ulcus ventriculi, chronic constipation. They are also used in gastric lavage as an addition to the water.

The alkaline spring waters, according to their constituents, are divided into those that contain sulphur besides the alkali (Glaubersalt Springs), those that are purely alkaline and those that contain sodium chloride.

The first group (Glaubersalt Springs) contains in 1,000 parts:

	Nat. sul.	Nat. bicarb.	Sod. chlor.	Free carb. acid	Temp., F.
Elster (Salzquelle)	5.2	1.68	0.82	986.84	48.42°
Marienbad (Ferdinandsbrunnen)	5.05	1.82	2.00	1127.74	48.2°
Franzensbad (Salzquelle)	2.84	1.16	1.15	831.42	52.16°
Karlsbad (Mühlenbrunnen)	2.39	1.28	1.02	104.1	136.04°
Tarasp (Luciusquelle)	2.06	5.45	3.67	1060.	42.8°

The second group (pure alkaline waters) contains in 1,000 parts:

	Natr. bicarb.	Calcar. bicarb.	Kalii bicarb.	Magnes. bicarb.	Natr. sul.	Sodium chlor.	Free CO_2	Temperat., F.
Vichy (Grande Grille)	4.9	0.4	0.4	0.4	....	0.5	460	39.38°
Fachiner	3.6	0.6	....	0.5	....	0.6	945	60.8°
Bilin (Sauerbrunnen)	3.4	0.4	....	0.2	0.7	0.4	1375	51.6°
Salzbrunn (Oberbrunnen)	2.1	0.4	....	0.5	0.4	0.2	980	44°
Neuenahr (Augustaquelle)	0.7	0.2	....	0.2	....	....	530	90.5°

The third group of waters will be discussed when the action of sodium chloride will be described.

Indications for the alkaline spring waters, like Karlsbad, Saratoga Springs, Tarasp, Vichy:

Chronic hyperacidity and hypersecretion, provided there is no advanced atony of the stomach and no marked neurosis of the stomach. Mild forms of atony of the stomach, caused by chronic constipation. Chronic ulcers of the stomach, chronic intestinal conditions, the chronic catarrhs of the intestines. If associated with diarrhea, the water is to be taken hot and in quantities not exceeding half a tumbler, while in constipation larger quantities (2 tumblers twice daily), also hot, ought to be taken.

A further indication is abdominal plethora. The waters also have an effect on diseases of the biliary tract, as chronic catarrh of the bile-duct and cholelithiasis.

Contraindications.—Diminished acidity or absence of hydrochloric acid; nervous dyspepsia; intestinal carcinoma; tuberculosis of the intestines.

The use of the waters at the spas is preferable inasmuch as the patient has the advantage of a thoroughly regulated life and surroundings as to diet, exercise, rest, etc. For patients who cannot afford to go to a spa, home treatment with the above-named waters will also prove beneficial, provided they will follow the regulations used at the spas.

Tarasp, in Switzerland, has the combined advantages of high elevation, mountain climate and alkaline waters.

Of the alkaline table waters, Saratoga Vichy (which is rather rich in carbonic acid), Vichy Celestins, Biliner water and Fachinger water are to be recommended.

The most important spring waters containing sodium chloride as their chief constituent are Homburg, with 9.8% sodium chloride; Wiesbaden, with 6.8%; and Kissingen, with 5.8%. They affect principally cases of diminished secretion. They are useful in subacidity and anacidity, in chronic catarrh of the stomach with diminished acidity, and in chronic intestinal catarrh. In chronic diarrhea, when associated with achylia gastrica, 1 to 1½ tumblers, taken hot, have a beneficial effect.

Some of the most important muriatic waters are Gleichenberg, with 3.5 Natrii bicarb. and 3.0 Natrii chlor.; and Ems, with 2.0 Natrii bicarb. and 1.0 Natrii chlor.

Before a patient is sent to any of these springs, a thorough understanding of the condition of the gastro-intestinal tract is absolutely essential, in order to insure the desired benefit. While at the spa the patient should be guided by his physician as to the amount and kind of water to be taken, and especially as to diet.

The same rule holds good for patients who do not go to the springs for a cure, but take the "cure" at home. The rules for use of the various waters at home may be laid down as follows: They should be taken on an empty stomach one hour before breakfast, at a temperature of 110° to 120° F., and in quantities of ¾ to 1 pint, drinking slowly, and taking a 20 minutes' walk afterward.

If indicated, the water should be taken twice daily, the second dose to be given 1 hour before supper in the same manner.

THE INFLUENCE OF HYDROCHLORIC ACID

Hydrochloric acid stimulates gastric secretion in cases of subacidity; in anacidity (achylia gastrica) the gastric glands are also stimulated to secretion if they can still be awakened to activity.

Experience has shown that even in cases of achylia gastrica where, pathologically, there is an atrophic gastritis, or in carcinoma ventriculi, and in congenital anacidity, HCl has its favorable effect on digestion.

Another property of HCl is its stimulating action on the pancreatic juice (*Pawlow*) by reflex from the duodenal wall. *Bunge* showed that the sour chyme reaching the duodenum comes in contact with alkaline duodenal juice caused by $NaHCO_3$ (bicarbonate of soda) contained therein, and the following chemical reaction takes place:

$$NaHCO_3 + HCl = NaCl + CO_2 + H_2O$$

The carbon dioxide given off forms minute bubbles, breaking up the food into finer particles, and so allowing the ferments to penetrate the food. And *Fleiner* is right in saying that what the teeth do not masticate and what the stomach does not dissolve can still be assimilated in the small intestines.

In our opinion, the reflex work of HCl on pancreatic juice and its chemical action in the duodenum explain why even small doses of hydrochloric acid suffice to aid digestion. An antiseptic and antifermentative action is also ascribed to HCl. It is furthermore considered a good stomachic.

Acidum hydrochloricum dilutum is given in 10 to 15 drop doses in ½ glass of water, to be taken slowly with the meals. In order to protect the teeth, it should be taken through a straw or glass tube. There are "Acidol" tablets in the market, each tablet containing 15 gr = 1 gram, and equal to 15 drops of the dilute hydrochloric acid.

As mentioned above, HCl has a better action, particularly in achylia gastrica, when combined with pepsin, according to the following formula:

Acidi muriat. dilute, Pepsini,	āā.....	10.0 drams iiss.
Aquæ		100.0

S. One teaspoonful in a wineglass of water, taken with the meal.

There are also Acidol-Pepsin tablets, one or two of which are to be dissolved in a glass of water and taken with the meals.

Judging from the properties of HCl, as described, the indications for its use are as follows:

(a) Subacidity;
(b) Anacidity;
(c) Achylia gastrica;
(d) Chronic gastric catarrh;
(e) Nervous subacidity associated with chlorosis;
(f) Gastric fermentation, when result of stagnation, if accompanied by subacidity.

AMARA (STOMACH BITTERS)

Through their stimulating effect upon the gastric nerves, amara excite gastric secretion, increase the appetite and, according to *Pawlow*, have some influence on intestinal peristalsis.

By virtue of their taste they have a stimulating influence upon the salivary secretion.

The drugs mostly used are: quassia, quinine, condurango, nux vomica and colombo.

Indications for Amara.—All forms of anorexia, provided it is not associated with hyperacidity or acute inflammatory conditions of the gastro-intestinal tract. Amara are used to advantage in nervous subacidity, anorexia associated with anemia, and general wasting diseases. Even in anorexia of carcinoma they are temporarily beneficial, especially so condurango. A few formulas will demonstrate the best mode of administration:

Tr. Rhei. vinosa, Tr. Chinæ comp.,	āā	15.0
Extr. fl. Condurango		30.0
Tr. nucis vom.		5.0

S. **25 drops 3** t.d., to be taken in ½ wineglassful of water 15 minutes before meals.

Tr. nucis vomica		5.0
Extr. Gentianæ comp., Extr. Colombo fluid.,	āā	30.0

S. **20 drops 3** t.d. in water 15 minutes before meals.

To the armamentarium of drugs used in gastro-intestinal diseases still belong orexin, which is used in the form of orexini tannici, 0.3 in capsules or wafers, twice daily, at 10 A.M. and 4 P.M., to be washed down with a cup of hot water. It is particularly useful in nervous anorexia, but contraindicated in hyperacidity, ulceration of the stomach and acute gastric inflammation.

THE ARTIFICIAL FERMENTS

Ptyalin

Ptyalin, the starch-splitting ferment of the salivary glands, splits part of the starch directly into dextrose and part into maltose, which is converted into dextrose in the intestines. It only acts in an alkaline medium and continues to act upon the starch, when in the stomach, for 10 to 15 minutes, until acid secretion begins.

In cases of hyperacidity, ptyalin loses its action in the stomach entirely. In cases of disease of the salivary glands, as well as in stomatitis with acid saliva, ptyalin loses action likewise. Hence, in all the conditions named, the starch digestion is impaired.

Ptyalin digestion can be replaced by giving the starches in a dextrinized form, like dextrinized flour, zwieback, toast, etc., or in cases of absent salivary secretion, by jaborandi in infusion or fluid extract.

The artificial form of ptyalin is also given in cases of hyperacidity in the dose of 0.5 to 1.0, combined with an alkaline.

Taka-Diastase

Taka-diastase is another artificial ferment to aid in the starch digestion. The first investigations in this respect were made in the United States. It is used by *Hemmeter*,[23] *Friedenwald*,[24] in hyperacidity. *Einhorn* uses it in intestinal fermentation. It should be given in doses of 0.3, 3 t.d., soon after meals.

Pepsin

While it was formerly believed that pepsin worked only in the presence of hydrochloric acid, it was shown more recently that it is

[23] J. A. M. A., 1897, Oct. 9.

[24] N. Y. Med. Jour., 1896, May 29.

even active in the presence of organic acid, with the difference that in the latter case pepsin must be present in a larger amount.

In most of the diseases of the stomach, pepsin is present even in the absence of hydrochloric acid. Only in rare cases of achylia pepsin is absent.

From a theoretical standpoint, therefore, the administration of pepsin is rarely indicated, unless the rule of *Leo* be followed, who states that hydrochloric acid works better when given together with pepsin.

The dose of pepsin is 0.5 to 1.0, to be given 3 t.d. after meals.

Papain

Papain has the advantage of the other ferments inasmuch as it has the power of converting proteids into peptone and albumose in a neutral, alkaline, or acid medium; in the latter, however, it acts best. *Chittenden*[25] has demonstrated that papain converts proteids into peptone and that the product is exactly the same as the one obtained by animal enzyme.

Rankin[26] claims to have obtained good results with papain in ulcer of the stomach, which he decided to use when he observed the favorable effect papain had on ulcers and fissures of the tongue. The use of papain in hyperacidity and ulcer of the stomach, however, is not advisable.

Dose in powder form: 0.5 to 1.0 3 t.d., after meals.

Pancreatin

Pancreatin acts in neutral and alkaline media only, and aids in the digestion of proteids, starch and fat.

The indications for its use are: Anacidity of the stomach, disturbed intestinal digestion and pancreatic diseases.

Pancreatin is prescribed in doses of 0.3 to 0.5 as "Pancreatin" (*Merck*).

As there is danger of the pancreatin being neutralized in the stomach, it should either be administered in capsules which will not dissolve in the stomach, or in the form of "Pancreon," which is Pan-

[25] Amer. Jour. of Physiol., March 1, 1888. [26] Lancet, 1895, II, No. 6.

creatinum gallicum, the gallic acid of which protects the pancreatin from being destroyed by the acid of the stomach.

Pancreon has a very favorable influence in achylia pancreatica (*Gross*).

REMEDIES STIMULATING PERISTALSIS (LAXATIVES)

The mode of action of laxatives varies according to what particular laxative is used.

Some remedies directly stimulate the nerves of the intestines, others produce their effect by osmosis, or by liquefying the contents of the intestines, others by stimulating the central nervous system.

A mild laxative is *Sugar of Milk*, the action of which is brought about by a strong transudate in the upper part of the small intestine. It can be given in tablespoonful doses 3 to 4 times a day with cereals, milk or compots.

The opinion that large quantities of water liquefy the feces is erroneous, as water is entirely absorbed in the small intestine. The favorable effect of cold water upon peristalsis is brought about by way of reflex.

Drugs that directly stimulate the nerves of the intestines are *aloin* in 0.01 doses, colocynth in 0.02 doses.

Eserin exerts its laxative effect by stimulating the central nervous system and has, therefore, been used subcutaneously in intestinal distention and post-operative paralysis of the bowels.

Those working by osmosis are the salts.

The so-called *Bitterwaters* have the same effect as the salts. Their chief constituents are magnesia and sodium sulphate (23 to 25%) potassium sulphate, sodium chloride, calcium sulphate in minute quantities (1 to 5 %).

The least drastic of all is the Friedrichshall Water, because it contains less sulphates than the other bitterwaters, like Pluto, Hunyadi Janos, Margarita, Apenta, Carabaña.

In chronic constipation as the result of obesity and plethora abdominalis, the bitterwaters can be used to advantage for 4 to 6 weeks, starting with a wineglassful on an empty stomach and diminishing the dose as the desired effect is accomplished.

The bitterwaters are rendered more effective if followed by a glass of cold water. Addition of orange-juice improves their taste.

Oleum ricini is only to be given in 1 to 2 tablespoonful doses when there is occasion to clear out the bowels only once, as in acute indigestion or acute diarrhea. The oil should precede the administration of an astringent in cases of diarrhea. Acute diarrhea is not infrequently seen to disappear after a dose of castor oil, due to the secondary astringent effect of the tannic acid it contains.

Pulvis Liquiritiæ Compositus owes its laxative power to the sulphur it contains. The dose is 1 teaspoonful to a tablespoonful at bedtime.

Rhubarb is a vegetable laxative and is given either as powder, 0.5 to 1.0, or as mixtura rhei and soda in tablespoonful doses.

A drug that deserves more mention than most of the others is *Cascara Sagrada*, which is a slowly acting, non-irritating cathartic and, according to *H. A. Hare*, does not produce the habit of taking cathartics. It is usually given in the form of extractum cascaræ sagradæ fluidum, in doses of ½ to 1 teaspoonful at bedtime.

The aromatic cascara sagrada should be given in larger doses, which also holds good for tasteless cascara. The tablets are given in 0.15 to 0.3 doses.

To *calomel* are attributed both antiseptic and laxative properties. It is useful only in acute gastro-intestinal conditions, with or without fever, to thoroughly evacuate the intestinal tract. The dose is 0.2 to 0.3, divided into 5 doses.

To the drastic laxatives belong aloes (0.1 to 0.2), infus. *sennæ* folia (10:200), *colocynth* extract (0.02), *podophyllin* (0.03), and resina *jalapæ* (0.3).

Phenolphthalein is a mild laxative (0.2 to 0.3).

Agar-agar,[27] first introduced by *Adolph Schmidt*, of Halle, acts by virtue of its hygroscopic property and also as a local stimulant like cellulose. Its administration should be preceded by one dose of castor oil or one dose of pulv. liquir. comp. After the bowels have been once thoroughly evacuated, agar-agar is given daily: one heaping teaspoonful with a cereal or compot with the supper.

This dose is continued for one week, when it is gradually diminished and the treatment kept up for 4 to 6 weeks.

[27] *Regulin* is agar-agar plus cascara sagrada.

With some patients it may be necessary to repeat the initial laxative once or twice in the course of the treatment. The virtue of agar-agar lies in the possibility of overcoming chronic constipation.

Hormonal.—Zuelzer [28] isolated from the spleen a peristaltic hormon which, injected into rabbits, causes a tonic contraction of the intestines, as demonstrated by *Zuelzer* skiagraphically.

It comes in two forms: one for intramuscular injection, to which about ½% of novocain is added in order to overcome the after-pain. The dose is, according to age, from 5 to 20 cc.

The second form is for intravenous injection without novocain, the dose being the same.

According to *Zuelzer*, one dose is sufficient to cure obstinate constipation, he having had 71% of good results. It is most efficacious intravenously and is undoubtedly at times a life-saving remedy (*Bier*) in post-operative intestinal paralysis.

The administration of hormonal should be followed by a laxative, castor oil, 8 hours later. It is given in order to expel the feces when in the ampulla, where there is no peristalsis. In achylia it will not act.

We had occasion to use hormonal in three cases. In one case of hemiplegia, associated with obstinate constipation, the remedy had an excellent effect, lasting two weeks; after that, any slight laxative had a favorable effect which was not the case before hormonal was given.

In the second case it was given intramuscularly and was only followed by two evacuations. In the third case it was injected intravenously, and there also was a temporary effect.

In certain forms of constipation—spastic—and constipation as a result of lead poisoning, opium will overcome constipation by relaxing the spasm.

A still better drug is *Belladonna* in form of the extract (0.01 to 0.015), or atropin sulphate (0.0005 to 0.001), or as suppositories of belladonna (0.02 to 0.03).

According to *Friedrich*, *Meyer-Betz* and *Theodor Gerard*,[29] who

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[28] Berl. klin. Wochensch., 1908, No. 46. Med. Klinik., 1910.
[29] München. Med. Wochensch. 34, 1912.

studied the action of laxatives skiagraphically, the following conclusions can be drawn:

Infus. sennæ exercises its laxative property on the colon only. Aloes in large doses, besides its action on the colon, produces spasticity. Castor oil has a very marked action on the small intestines, and also on the large intestines. Jalap increases the secretion of the small intestines, so causing peristalsis; on the large intestine it may have a direct mechanical effect. Calomel works both on the small and large intestine. The salts have their influence, causing excessive transudation, and thereby peristalsis.

CARMINATIVES

The following carminatives are used in the form of infusions to a great extent in Germany: Peppermint tea, fennel, anise, camomile, caraway seeds, valerian. They are prepared by adding 1 to 2 teaspoonfuls of the tea to a tumblerful of water. Peppermint oil, 1 to 2 drops on sugar.

Animal and vegetable charcoal are frequently used with the object of absorbing gas, but its efficacy is quite questionable, as these substances can only do so in a dry state.

In flatulence and meteorism some drug combinations are used to advantage, as for instance:

Magnes. ustæ 35.0
Bism. salicyl. 5.0
Menthol pulv. 2.0
Mf. pulv.
S. One teaspoonful 3 t.d. after meals (*Boas*).

Olei fœniculi,
Olei menthol,
Magnes. ustæ } āā..... 5.0
Extr. nucis vom. 0.1
Extr. belladonnæ 0.15
Mf. pilul. No. 100.
S. 2 to 3 p. 3 t.d.

Magnes. ustæ 15.0
Elæsacch. menth. piper. 5.0
F. pulv.
S. ½ teaspoonful 3 t.d.

SEDATIVES

Opium and its derivatives diminish gastric secretion and prevent the stomach from emptying itself in the proper time.

Pantopon, a drug containing the alkaloids of opium, has not, according to *Sahli*, such a harmful influence on the gastro-intestinal tract as the other opiates.

A drug to be used in irritative conditions of the gastro-intestinal tract, associated with hyperacidity and spastic conditions of the stomach and intestines, is *belladonna* and its alkaloid, *atropin*.

It should be remembered that belladonna and atropin tend to retard gastric digestion and should, therefore, be administered 1 hour after a light meal or 2 to 3 hours after a heavy meal. Belladonna may also be used as a suppository, as mentioned above.

Other sedatives are *cocain*, *orthoform* and *anesthesin*.

The indications for the use of sedatives are very limited, as the object of treatment should be to remove the cause and not merely to palliate the symptoms.

The influence of hypnotics on the digestive tract is undoubtedly irritating and, dealing with patients who at the same time suffer from insomnia, efforts should be made to overcome the complaint by hydrotherapeutic means or mild bromides, particularly strontium bromide (0.5). If it is absolutely necessary to use hypnotics, only those known as the mildest, such as *veronal* or *medinal*, should be given in doses of 0.5 to 1.0.

Of late, *adalin* has been recommended as a mild hypnotic without irritating the stomach in doses of 0.5 to 0.7.

ASTRINGENTS AND STYPTICS

Argentum Nitricum.—It is recommended either in pill form, in doses of 0.01 for ulcer of the stomach, or in solution, 1:1000, for hypersecretion and ulcer. *Boas* and *Rosenheim* have used nitrate of silver (1:1000) for lavage of the stomach in hyperacidity and ulcer of the stomach. In chronic diarrhea and chronic dysentery ¼ to ½% is given as intestinal irrigation.

A much more favorable influence is exerted by the *bismuth* preparations, the best of which is bismut. carbon. (1 to 2 grams, 3 t.d.),

because it is less constipating and least poisonous. Next comes bismut. salicyl. (0.5 to 1.0), which is also antiseptic, and bismut. subnitric. (1 to 2 grams). The indications for the use of bismuth are hyperacidity and diarrhea.

Another group of astringents are the *tannates.*

Tannic acid has been used for irrigation of the bowels, for chronic diarrhea and dysentery (1:500).

The tannic acid preparations which are used internally are: *Tannigen* (0.5), *tannalbin* (0.5), *tannopin* (0.5) and *tannoform* (0.3).

As to the solubility in the intestines of the different tannic acid preparations, tannoform is the most soluble; then follow tannalbin, tannigen and tannopin, in the order named.

Radix Colombo, which has also astringent properties, is used in the form of infusion or tincture.

Bolus alba, white clay (Kaolin), 100 to 150 gm in a quarter litre of water, taken on an empty stomach, has been recommended as an astringent.

Calcium phosphate and *calcium salicylate,* 1 teaspoonful 3 t.d., has been used by *Boas* as an astringent and antacid.

The two aluminum preparations, *neutralon* and *eskalin,* have also been recommended as an antacid and astringent.

Neutralon 1 teaspoonful 3 t.d. in a glass of water, before meals.

Eskalin as pastilles, 4 in a glass of water 2 hours before meals.

Gelatin and *Serum* will be fully discussed in the chapter on "Gastric Hemorrhage."

Formulæ:

Argenti nitrici	0.2
Aquæ	120.0

Vitrum nigr.

S. 3 t.d. a tablespoonful before meals.

Dermatol (Bism. subgallic.)	10.0
Calcar. carbon	20.0

Mf. pulv.

S. ½ teaspoonful 3 t.d.

Bism. subnitric.	20.0
Magnes. ustæ	10.0 to 15.0
Aquæ	200.0

S. One tablespoonful 3 t.d. ½ hour before meals in ½ tumblerful of water.

Some antiseptic antifermentative drugs may be mentioned: Salol, resorcin, guaicol, thiocol, benzonaphthol, bism. salicyl., menthol. Magnes. salicyl. (2 to 3 gr daily).

A few prescriptions may serve as examples:

℞ Resorcin resublimate 2.0
Aq. chloroformi 150.0
Vitrum nigrum.
S. One tablespoonful 3 t.d.

℞ Benzonaphthol,
Resorcin resubl.,
Bismut. salicyl.,
Magnes. ustæ, } āā 10.0
S. ½ teaspoonful 3 t.d.

℞ Resorcin resubl. 5.0
Bism. salicyl.,
Pulv. rad. Rhei,
Natrii sulph., } āā 10.0
S. ½ teaspoonful 3 t.d.

℞ Menthol 0.1
Calcar. carb. 0.5
Dent. totales dos XII.
S. 3 t.d. 1 powder.

℞ Resorcin resubl. 2.0
Bism. salicyl. 4.0
Glycerin 20.0
Aquæ 160.0
S. 1 tablespoonful every 2 hours.

Another antifermentative is the 25% Magnesium perhydrol, especially in mild forms of stagnation. We give it in teaspoonful doses three times daily on a fasting stomach, after dinner and after supper.

INDICATIONS FOR OPERATIVE TREATMENT OF THE GASTRO-INTESTINAL TRACT

If *foreign bodies*, present in the stomach, are of a nature that they cannot be removed by emesis or evacuation, operation (gastrostomy) is indicated.

Obstructions at the cardia of a benign or malignant nature, with their consequences of partial or total dilatation of the esophagus above the stricture, indicate operation (gastrostomy).

In *benign strictures*, after the operation, dilatation of the stricture is performed from below in order to permanently overcome the stricture.

Ulcer of the stomach in its uncomplicated state is a medical disease.

Hemorrhage of the stomach, as a rule, yields to internal treatment, and operation becomes indicated only when the hemorrhages have a tendency to repeat themselves. The time to operate is most favorable, according to statistics, during the intervals.

Perforation of the stomach should be immediately turned over to the surgeon, as the results are most favorable when the operation takes place at the earliest possible moment.

In ulcer of the stomach causing pylorospasm, either because of its location near the pylorus or reflexly, and where medical treatment has failed, operative interference (gastro-enterostomy) favors recovery.

Callous ulcers of the stomach indicate operative interference, because they have a tendency to degenerate into carcinoma, and also to cause obstruction at the pyloric end (stenosis of the pylorus).

Penetrating ulcers, with their continuous annoyance to the patient, indicate operation on account of the adhesions to the adjacent organs.

Organic hourglass contraction of the stomach must be operated.

Duodenal ulcer may indicate early operative interference on account of its frequent tendency to perforation.

After a gastro-enterostomy, the diet must be more carefully guided even than before, judging by the mechanical power of the

stomach and the result of the chemical examination of the stomach contents. It is important to establish whether there is trypsin in the stomach, as its presence would point to regurgitation of duodenal juice, as described in Chapter X, p. 276.

In *carcinoma of the stomach* it is essential that a diagnosis be made as early as possible in order to make the unavoidable operation a success.

Surgery of the Intestines

The most frequent occasion for operation on the intestinal tract is that of *appendicitis.* Appendicitis should be turned over to the surgeon just as soon as the diagnosis is made. The mortality is the lowest when operation takes place within 24 hours or in interval operations. *John B. Deaver,* the *Mayos,* and others have rightly established the following rules as to the time of operation:

The best time is between the first 12 or 24 hours. If the patient is seen after 24 hours and the local condition as well as the blood picture and the general appearance of the patient are such as to exclude complications, it is safe to wait for the interval; but then the patient should surely be operated on, as nobody can tell with what virulence the second attack may come.

If general peritonitis has set in, mortality is much less if operation takes place at once, as is borne out by the statistics of *Rotter, Spengel* and *Deaver.*

Other abdominal surgical diseases which follow appendicitis or coincide with it are *subphrenic abscess* and *gall-bladder diseases;* in women, *adnexal suppuration* and *abscess* in the cul-de-sac of Douglas.

Carcinoma and *tuberculosis* are rare affections of the appendix.

Other diseases of the intestines that require surgical interference are all those causing stenosis of the intestines. Most frequent is *carcinoma,* then follow *scar-formation* as a result of tubercular or dysenteric ulceration, *strangulation* and *intussusception.*

At times, persistent ulcerative *colitis* or *enteritis membranacea* necessitates an appendicostomy for the purpose of treating the bowels through the opening made.

Colostomy is also necessary in *multiple polyps* of the lower bowel with the object of making an artificial anus, in order to exclude the affected part from the irritation of the feces.

Of late, the *movable cecum* and *pericolitis* have been classified among the surgical diseases of the intestines.

Congenital dilatation of the colon (*Hirschsprung's* disease), when not yielding to medical treatment, must be surgically interfered with.

Prolapsus ani, fissure and *hemorrhoids* are, for the most part, surgical diseases.

The most important postoperative complication is *paralysis of the bowels*, which is to be overcome by lavage of the stomach, intravenous administration of hormonal, placing the patient on the abdomen and active stimulation. Sometimes jejunostomy must be done to overcome the distention.

Post-operative peritonitis is treated by elevating the head-end of the bed and continuous *Murphy* irrigation. Oftentimes a second operation may become necessary.

Post-operative adhesions and *herniæ* often necessitate operation.

Epigastric herniæ very frequently demand operation. The diagnosis is established when a protrusion appears in the epigastric region, which disappears in the recumbent position.

ADDITIONAL CURATIVE AGENTS

Aside from the balneologic and hydrotherapeutic procedures in gastro-intestinal diseases already mentioned, changes of climate and surroundings as well as voyages have a favorable influence on gastric diseases of a functional nature.

Plethoric patients belong at the sea, to get the effect of the sea-baths on metabolism. Gastro-intestinal diseases associated with anemia are benefited in a moderately high climate (1,500 to 2,000 feet).

The best results are obtained in well-equipped and conducted sanatoria, where the advantages to the patient are numerous. Here he can be properly observed and a proper diagnosis arrived at. He is taught exactly how to live, which will serve him as a schooling when out of the sanatorium.

It would, in our opinion, be a great progress in the treatment of gastro-intestinal diseases if institutions of this kind existed exclusively for patients suffering from these diseases.

CHAPTER III

Special Therapy of the Gastro-Intestinal Diseases

Diseases of the Esophagus

METHODS OF EXAMINING THE ESOPHAGUS

Inspection may aid in the diagnosis of esophageal disease, when there is a diverticulum of the upper third of the esophagus. A protrusion is seen at the jugular vein, sometimes reaching the size of a walnut.

Palpation may reveal an enlargement of the glands along the anterior border of the sternoclidomastoid muscle, indicating malignant involvement of the esophagus.

A very important aid in diagnosis is the esophageal sound. The sound should always be preceded by a soft stomach tube. If an obstruction is met with, we should wait and ask the patient to swallow, so as to distract his attention, whereby we may overcome a spastic obstruction. If we do not succeed with the stomach tube, we either use a tube with mandrin or we proceed with a metal sound, which is a flexible sound, marked in centimetres, to which ivory or metal olives of various sizes are attached (see Fig. 5). Always start with the larger size.

Patient is to sit in a chair, with perfect composure; false teeth are removed. The instrument is moistened with hot water or glycerin. If a patient is hypersensitive, or coughs, cocainize pharynx with 2% cocain.

The instrument is held in the right hand like a penholder, and the tongue depressed with the index finger of the left hand. A slight hindrance at the pharyngo-esophageal junction is easily overcome by asking the patient to swallow.

Under normal conditions the instrument glides down into the stomach with ease. With the aid of the sound we determine (1) sensitive spots in the esophagus: an important diagnostic point, because, normally, the esophagus is not tender; (2) resistance, in cases of spasm, foreign bodies, inflammatory strictures and new growths; (3) the sound may sometimes go too much to one side of the esophagus, which speaks for dilatation; (4) a thin sound would not pass, while a thick one would, as in nervous spasm. The reverse is true of diverticula when they are full. To determine the seat of the hindrance, we read the distance from the teeth on the graded sound. Sounds are not to be passed in aneurisms and uncompensated cardiac disease, varicose veins of the esophagus, ulcer of the stomach, cirrhosis of the liver and advanced arteriosclerosis.

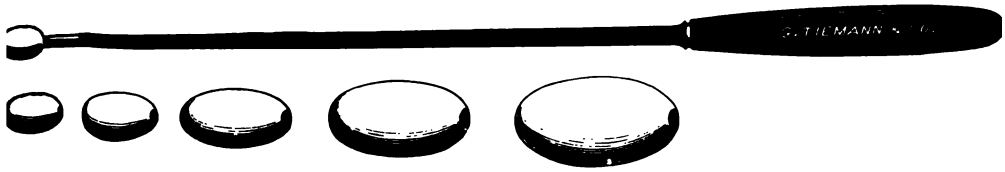

FIG. 5.—Flexible Sound with Olives.

Auscultation.—When the patient swallows fluid and we listen posteriorily to the left of the spine, corresponding to a point between the 9th and 10th ribs, and anteriorly at the xyphoid process, normally two sounds are produced by the fluid passing the esophagus. The first is the result of the act of swallowing and is usually not perceived; the second sound, due to the contraction of the esophagus, is normally heard in from 3 to 4 seconds after swallowing; a delay of the second sound of 10 to 15 seconds speaks for an obstruction in the esophagus. In advanced obstruction the second sound is not heard at all. Another sign of obstruction is that the second sound is not heard until the patient is told to swallow empty.

Esophagoscopy.—The esophagoscope devised by *Rosenheim*, *R. Lewisohn* and *Brünning* proves quite effective. Patient is examined on an empty stomach. If a diverticulum is suspected, the esophagus must be thoroughly cleansed by passing a special esophageal tube to

the diverticulum, through which a thin stomach tube is passed, with patient in the recumbent position.

For examination of the patient with the esophagoscope, the position is the same.

Patient is to open his mouth widely, and the tube is passed with an obturator in the manner described for the passage of the esophageal sound, and when the suspected spot is reached the obturator is removed, light is introduced, and the examination proceeded with. To the experienced examiner the esophagoscope marks the diseased portion with fair accuracy.

The esophagoscope is contraindicated wherever the sound is contraindicated.

Acute Esophagitis

Etiology.—Mechanical, chemical or thermic irritations, by extension from the pharynx or the stomach. Sometimes associated with acute infectious disease.

Symptoms.—Severe substernal pain; pain on swallowing; slight elevation of temperature; marked thirst. Introduction of the sound causes pain and even spastic contraction.

The affection usually subsides in a few days, unless complications set in.

Treatment.—Small pieces of ice for the thirst.

Diet.—Lukewarm milk and strained cereals for a few days; for two weeks all the food should be given in purée form.

The pain sometimes necessitates the use of morphin.

Chronic Esophagitis

is mostly due to the abuse of alcohol and tobacco, stasis as a result of cardiac and renal affections, diverticula and strictures, but sometimes it follows the acute stage.

Symptoms.—Sometimes there are none, and the disease is discovered post mortem. Mostly, however, there is a sensation of pressure under the sternum; besides, the patient feels that the food stops at a certain spot, to go down again.

On auscultation we find a delayed second swallowing sound, and the esophagoscope aids in the diagnosis.

Prognosis is favorable as to life, but the disease is very resistant to treatment.

Treatment.—Prohibit alcohol, smoking, eating spices, and partaking of food of extreme temperatures. All food is to be of a nature not to irritate mechanically.

Thorough mastication should be strictly adhered to.

Pure olive oil before meals in tablespoonful doses will serve as a soothing agent to the mucous membrane of the esophagus.

Esophagitis Exfoliativa

may be acute or chronic, and is characterized by the patient bringing up large quantities of mucus under a sensation of choking. Microscopically, the masses contain epithelial cells and mucus.

Besides the general symptoms of esophagitis, the patient has often the sensation of suffocation, which is relieved on bringing up large masses of mucus. The introduction of the esophageal sound in such cases is dangerous.

Fibrinous (Diphtheritic) Esophagitis

occurs most commonly in the course of severe infectious diseases like variola, cholera, typhoid fever, tuberculosis and pneumonia. Rarely by extension from the pharynx.

The diagnosis is based upon bringing up diphtheritic membranes and the microscopic examination of the same. The disease is mostly fatal.

Phlegmonous Esophagitis

is a very serious affection.

Etiology.—A foreign body that has been lodging in the esophagus for a long time, or the breaking through of pus from the neighboring organs (bronchial gland abscess, or abscess of the cervical vertebra).

Symptoms.—Difficulty in swallowing, suffocation and bringing up of large masses of pus, and septic temperature.

Esophagitis Corrosiva

Etiology.—Corrosive poisons, acid or strong alkalies.

Symptoms.—Severe substernal pain, bringing up of bloody masses, impossibility to swallow, intense thirst. In very severe cases there is marked shock. It may lead to abscess formation and perforation. In moderately severe cases the symptoms subside within a week, and after a few weeks symptoms of stenosis as a result of scar tissue formation begins. In mild cases complete recovery takes place.

Treatment.—Proper antidotes, iced milk, morphin hypodermatically, for the pain; shock to be overcome by active stimulation. To maintain nutrition, rectal feeding must be resorted to for several days.

Rare cases of obstruction of the esophagus are gumma and syphilitic ulceration as well as tubercular ulcerations.

Aside from the symptoms of obstruction, the exact diagnosis is only possible when there are manifestations of the above disease in other parts of the body.

Ulcus Pepticum Esophagi

At times it happens that an ulcer develops in the lower third of the esophagus, giving rise to symptoms closely simulating an ulcer of the stomach near the cardia.

The exact cause is not known, but a predisposing factor is regurgitation of acid food, and its stagnation of that portion of the esophagus would give rise to ulceration. Low vitality or disease of the blood-vessels, or previously existing esophagitis, are probably predisposing factors. The ulcer is usually single, but may also be multiple, and leads to scar tissue formation or malignancy.

Symptoms.—Burning pain at the xyphoid which occurs soon after deglutition, solid food giving more pain than liquids. There is also regurgitation of food. The passage of the sound when it reaches the area of the ulcer causes extreme pain and spastic obstruction. Under favorable circumstances the ulcer may heal; most commonly it gives rise to obstruction and sometimes it leads to perforation.

Treatment.—The best treatment to give is that prescribed for

ulcus ventriculi (see p. 131). In later stages, when there is obstruction, gradual dilatation is indicated.

Actinomycosis of the Esophagus

may occur and give rise to the symptoms of esophageal obstruction.

The diagnosis is made if the fungi are found in the excised muscle.

Polypi, fibroma and sarcoma are extremely rare.

Carcinoma of the Esophagus

is very frequent; it is mostly primary, sometimes secondary to carcinoma of the stomach, pharynx, thyroid gland. The most common seat is either at the bifurcation of the trachea or where the esophagus passes through the diaphragm. It is more common in men than in women, and occurs mostly between the ages of 40 and 60 years. Predisposing factors are ulceration, foreign bodies and stricture.

Symptoms.—The first and most important symptom is difficulty in deglutition, first for solids, then for semisolids, and finally even for liquids. The condition advances quite rapidly, causing complete obstruction with death by starvation. Patients have the sensation of the food stopping at a certain place which, however, does not always correspond to the seat of the cancer. Not infrequently patients have the sensation of the food stopping at the pharynx when the obstruction is really at the cardia, and vice versa.

Deglutition often becomes easier in the course of the disease, due to one of two causes: either the breaking up of the carcinomatous tissue making the lumen wider, or the temporary disappearance of the previously existing spasm associated with the carcinoma.

Pain is a late symptom, usually the result of mediastinal metastasis. It is boring, burning, radiating to the shoulders and other parts of the chest. Its pressure on the large vessels often gives rise to angina pectoris, pressure on the recurrent laryngeal nerve causing aphonia.

Other signals of mediastinal pressure, such as unequal pupils or unequal radial pulses, may also be present.

Where perforation of the esophagus occurs, abscess of the lung, etc., may result. In the majority of cases inanition and cachexia develop rapidly.

Objectively enlarged glands, chiefly the anterior cervical and supraclavicular, are present; if the tumor is in the upper portion of the esophagus, a tumor may be seen at the trachea. In deeply situated tumors, the esophageal sound, preceded by the stomach tube, aids in localizing the tumor. When the sound is removed, the end should be inspected for particles of carcinomatous tissue.

Esophagoscopic examination distinctly discloses the cancer. X-ray examination aids materially by showing the dilatation above the stenosis; also where the bismuth stops.

The auscultating phenomenon upon the patient taking fluid is a delay of the second contracting sound, or its complete absence. According to *Revicz*, the accessory sound due to empty swallowing is a pathognomonic sign of obstruction.

Prognosis is fatal.

Duration of illness is usually from 10 to 12 months.

Esophagotomy can only be performed with success if the cancer is situated in the upper part of the bifurcation of the trachea.

Treatment.—Liquid food, potassium iodide may be tried, also methylene blue in doses of 0.03. Morphin and belladonna may be necessary for the pain.

Stenosis of the Esophagus

Etiology.—A. From within: inflammation of the esophagus, neoplasms and foreign bodies. B. From without: tumors from the mediastinum, from the spine; enlarged thyroid; enlarged lymphatic glands; aneurysma aortæ; periesophageal abscess, and filled diverticula.

The diagnosis is based upon careful history and other associated symptoms.

Dilatation of the Esophagus

may be diffuse or partial. In the former case the dilatation of the esophagus is uniform; in the latter case there are isolated areas of dilatation which are usually found above a stricture. The com-

pensation of the muscle had ceased, in consequence of which the food stagnates. Prolonged spastic conditions on an ordinary neurasthenic basis is also liable to lead to dilatation.

According to *Rosenheim*, atony of the esophagus primary to dilatation is due to spasticity. Trauma is sometimes a factor. A disease of the nerves controlling the esophagus (vagus) may cause dilatation. A congenitally narrow foramen in the diaphragm where the esophagus passes may cause obstruction and dilatation above. It occurs usually between the ages of 15 and 40.

Symptoms.—Intensity varies, not depending upon degree of dilatation. Most frequently gastric symptoms precede the esophageal obstruction; and only later they begin to cause symptoms such as difficulty in deglutition, a sensation that the food is arrested at a certain place; regurgitation of food with a sensation of choking and coughing. As the ectasia progresses, food that has been taken the day previously is vomited. There is also fetor ex ore. Dyspnea is often a troublesome symptom.

As the dilatation presses on the mediastinal organs, nerves or vessels, it gives rise to symptoms depending upon what organ the pressure is exercised.

The diagnosis is materially aided by the stomach tube and sound. The latter conveys the impression of moving around in a large bag. The X-ray confirms the diagnosis.

The prognosis is not favorable as far as complete recovery is concerned, but the condition may last for many years.

Treatment.—The most important part is esophageal lavage in the evening and, if necessary, also in the morning. The patient ought to be instructed to attend to the lavage himself and to use a 4% boric acid solution. If necessary, nourishment may be administered through the stomach tube. Rest in bed for 3 to 4 weeks is essential. Readily assimilable, highly nourishing food should be given every 2 hours.

When the esophagus is very irritable, rectal feeding may be indicated. In marked cardiospasm, belladonna suppositories, 0.03, should be used, or the sound may be applied with care and without force, which may overcome the spasm. The sound, however, should not be used when the spasm is the result of inflammation or ulceration.

For atony of the esophagus hypodermic application of strychnin or the galvanic current may prove effective.

If all the above-named procedures should be without avail, dilatation of the esophagus by way of gastrostomy, as advised by *Mikulicz*, must be resorted to.

Cardiospasm

We consider cardiospasm under a special heading, first, because it is comparatively not a very rare affection; second, because it is very frequently overlooked, especially in the initial stages of the disease. In cardiospasm we have to deal with a spasm at the cardiac end of the esophagus, of shorter or longer duration, followed finally by dilatation and hypertrophy of the esophagus one-third to two-thirds of its length above the stenotic part (sacculation).

Cardiospasm is quite often found in neurotic people. We also find it as a consequence of pathologic processes above or below the diaphragm—ulcus ventriculi or esophagi, syphilis, or carcinoma of the stomach; furthermore, after old adhesive pleuritis sinistra (*Bassler*). Cardiospasm due to fissure, ulcus at the cardia, is discussed in another chapter.

Sacculation of the esophagus above the constricted part can be prevented or delayed by diagnosing the spasm in its earliest stages. The complaints of the patient at the beginning of the disease impose usually as a "nervous dyspepsia." These patients complain of a "lump in the stomach"; of a sensation of fulness immediately after partaking of food; they also complain of a burning sensation in the epigastrium behind the processus ensiformis. They rarely complain of real pain, which radiates toward both hypochondriac regions. A frequent and very characteristic complaint of patients suffering with cardiospasm in its initial stages is an increase of the severity of the symptoms after drinking cold water. Atropin (0.001) subcutaneously relaxes the spasm, as a rule. Another important symptom is the spontaneous relaxation of the spasm, which makes the swallowing surprisingly easy for a short time.

Later symptoms are: More or less difficulty in deglutition, temporarily changing in severity, dependent upon the quality and quantity of food. At a later stage patients complain of the food

lodging under the end of the sternum, which feeling they may be able to overcome by swallowing air (*Leerschlucken*). Later on, the swallowing of solid food is impossible, and only liquids of moderate temperature pass the obstruction. As a rule there are more painful sensations in cardiospasm in its primary stage than after sacculation is formed.

X-ray and the stomach tube quickly aid in the diagnosis. The

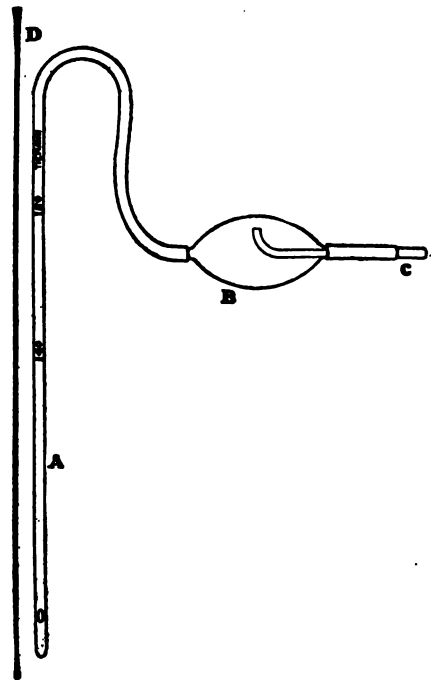

FIG. 6.—Soft esophageal tube A, with obturator D, aspirating bulb B and mouthpiece C.

latter, more easily accessible to the physician, ought to be used even in case of the slightest suspicion of an existing cardiospasm. For this purpose we introduce a thin stomach tube, armored with a mandrin (Fig. 6). The mandrin prevents bending of the soft tube above the spasm, which may obscure the diagnosis. At the place of the spasm we experience a hindrance for the tube, but there is no pain felt by the patient as in ulcus pepticum cardiæ.

Patients with fully developed sacculation usually feel the col-

lection of the food in the sac distention, but no pain; regurgitation of esophageal contents into the mouth and nose is a frequent occurrence, especially during the night, when, reaching the trachea, causes fits of coughing and suffocation. These patients do not vomit—they cannot vomit; the esophageal contents come up sometimes in large quantities by eructation; they are very often compelled to get up from the table and empty the esophagus and then return to eat more.

To make the chemical analysis we introduce a small stomach tube with mandrin into the stomach, removing the mandrin and so obtaining the characteristic sour stomach contents; we then withdraw the tube to about 38 cm and obtain esophageal contents, which are coarse, flocculent and contain saliva and mucus in great quantities; they are odorless and show mostly neutral or slightly acid reaction due to lactic acid; they invariably contain sugar. The esophagoscope, as a more strenuous procedure, may have to be resorted to sometimes.

Treatment.—First treat the underlying cause. We then order the patient a food non-irritating thermically, chemically and mechanically. We avoid local irritation of any kind in the initial stages, and best use remedies that exert a soothing and healing effect on the spastic part: oil in tablespoonful doses before meals and bismuth, as

Bismut. subnitr.	20.0
Magnes. ustæ	10.0
Aquæ	ad. 200.0

S. One tablespoonful 3 times a day, ½ hour before meals, in ½ a tumblerful of water.

In cases of sacculation we relieve the patient a great deal by frequent esophageal lavage. Stretching of the cardia will also relieve the symptoms, but will not, according to *J. C. Meyer* and *R. D. Carman*,[1] improve the anatomical changes. The divulsion is made by means of a silk-rubber bag, from 3 to 3.5 cm in diameter, by hydrostatic pressure (*Plummer*). Another instrument for stretching of the cardia is the balloon sound, devised by *Gottstein*.

[1] Journal Am. Med. Assoc., Oct. 5, 1912.

Diverticula Esophagi

These are very rare. The most usual seat is at that part of the esophagus which is nearest the pharynx. The muscle of Laimer being the weakest point, allows the protrusion of the mucosa, thus causing diverticula. They occur mostly in men of advanced age.

The weakened muscle and congenital defects are considered predisposing factors. Exciting factors are: irritation by foreign bodies; hasty eating; partaking of food of extreme temperatures; excessive use of alcohol and tobacco; partaking of highly seasoned food.

Symptoms.—Early in the disease there may be no symptoms at all; later the symptoms are gastric in nature, such as epigastric pressure, nausea and regurgitation. As the condition progresses, deglutition becomes difficult.

A great part of the food may lodge in the diverticulum for days, giving rise to fetor ex ore; the food vomited is also of bad odor.

In the last stages deglutition is impossible and death is the result of inanition.

Objectively, a diffuse or circumscribed swelling is seen on the neck in advanced cases, which can be made to disappear by pressure, forcing out the food into the mouth.

Pressure on the large vessels and nerves of the thorax give rise to corresponding symptoms.

The greatest aid in the diagnosis consists in the esophagoscope and the X-ray.

The course is usually very chronic, the termination is fatal as a rule, although operations by *von Bergmann, Willy Meyer* and others make the outlook more favorable.

Treatment.—Berkhaus advises the daily use of a bougie with a gutta-percha cone-shaped end for a month. Patient is fed in the horizontal position.

For the stagnation esophageal lavage is done night and morning. If necessary, food must be administered through the tube or by the rectum.

Rupture of the Esophagus

is due to a very rapid, progressive softening of a certain portion of the esophagus. It occurs intra vitam sometimes, if that agony lasts

for a long time and the gastric juice flows back to the esophagus and becomes stagnated there, thus digesting the esophageal tissue. Such occurrences are not infrequent in infectious diseases.

According to *Rosenheim*, habitual vomiting or regurgitation as a result of atony of the esophagus may serve as a predisposing factor. The exciting cause may be strain or coma.

Symptoms.—Onset is sudden. Patient has the feeling as if something were broken under the sternum. Sometimes blood is vomited. Dyspnea, extreme anxiety and collapse develop rapidly, subcutaneous emphysema of the neck, and sometimes of the entire chest, as a result of air entering the mediastinum occurs. Pneumothorax and pyopneumothorax are not infrequent. Death usually results in the course of 24 to 48 hours.

The treatment is purely symptomatic. Narcotics and stimulation.

Perforation of the Esophagus

is more common in men than in women, and occurs at an advanced age, most commonly at the bifurcation of the trachea. Carcinoma of the esophagus is one of the etiological factors; other factors are pressure of the esophagus from without by tumor of the lung, cervical caries, aneurisms of the thoracic aorta.

Symptoms.—Sets in gradually, at first giving signs of esophageal obstruction, like difficulty in deglutition. Gradually a fistula forms with neighboring organs, giving rise to corresponding symptoms.

When a fistula forms with the trachea, food comes back by coughing and suffocation. If fistulas communicate with the lungs or pericardium, pyopneumothorax or pyopericardium results.

Prognosis is fatal.

Treatment symptomatic.

Hemorrhages from the Esophagus

Etiology.—Stab wounds, ulcer, toxic esophagitis, cancer, rupture and varicose veins.

Treatment.—Ice pills, adrenalin (1:1000), 20 drops subcutaneously; ergotin, subcutaneously; gelatin (*Merck*), intramuscularly. Liquor ferri sesquichlor., 5 drops every hour. Icebag on chest.

Complete rest. Morphin hyperdermically. If treatment is not effective, serum, intramuscularly, should be used.

Neurosis of the Esophagus. Hyperesthesia of the Esophagus

Etiology.—It is most frequently associated with hysteria and neurasthenia.

Symptoms.—Painful deglutition, especially when solid food is taken. Pain continues after the food has passed down. Sometimes the food stays in the esophagus a little while on account of the reflex spasm that results.

A feeling of pressure and tightening under the sternum and a feeling of a mass in the esophagus corresponding to the bolus hystericus is experienced. There are frequently associated gastric disturbances.

Treatment.—The general nervous system requires treatment by hydrotherapy, electricity, nourishing food and change of climate. Internally, solution of silver nitrate 0.2:100.0, 2 teaspoonfuls 3 times daily before meals, is beneficial. The introduction of the stomach tube, around which is applied a 0.4:10.0 cocain solution, will reduce the hyperesthesia. Bromides, valerian and atropin may have to be resorted to.

Esophagismus

Etiology.—Most commonly hysteria and neurasthenia, also epilepsy, chorea, tetanus, diseases of the central nervous system, foreign bodies, strong drinks and spicy food.

Reflexly from the pharynx and intestinal worms. Diseases of the genital apparatus and trauma of the thorax and head; poisoning by strychnin, belladonna, stramonium, meat poisoning (ptomaine), aortic sclerosis. The affection is more common in women than in men and occurs mostly in middle age.

Symptoms.—Dysphagia of an intermittent type. The degree of the disturbed deglutition varies. Solid food usually passes without difficulty; at other times solids will pass when fluids could not pass; sometimes everything is regurgitated.

Upon examination with the stomach tube we meet with an obstruction which is often overcome when the patient is made to swallow a few times. If we do not succeed with the soft tube, a

solid sound is passed and kept for a little while at the place of obstruction without forcing it down, until the spasm is overcome, when the sound will slip down.

The diagnosis is made possible by considering the underlying cause, the changeability of the symptoms, the periods of absolute freedom from symptoms, overcoming of the spasm by the sound or the use of atropin. The esophagoscope and X-ray aid in the diagnosis: the former by excluding every pathological appearance of the esophageal mucosa, and the latter by finding no dilatation above the stricture, and after the use of atropin the food is seen to pass down very rapidly.

Treatment.—First treat the nervous system by hydrotherapeutics, electricity, nourishing food, bromides, valerian and atropin internally. The esophageal sound is used without force, always beginning with the largest size.

In very severe cases rectal feeding may be necessary for a few days.

Paralysis of the Esophagus

Etiology.—Intracranial diseases, apoplexy, direct pressure or disease of the vagus.

Diagnosis.—This is based on the fact that liquids pass readily, while solids pass with difficulty and have to be washed down with fluids. The sound meets with no obstruction.

According to *Holzknecht* (skiagraphically), the fluid sinks down without the normal contraction of the esophagus.

Treatment.—Treatment is directed to the underlying cause. Strychnin hypodermatically, fluid feeding, and sometimes feeding through the tube. Local electricity to the esophagus is useful.

Paresis and Atony of the Esophagus

occur in people with asthenic habitus, mostly in women, associated with atony of the stomach.

Symptoms.—Intermittent dysphagia; fluid goes down readily but slowly, so that the sound due to contraction of the esophagus forcing the food into the stomach is delayed. Solid food goes down with difficulty and has to be washed down with some fluid.

The sound meets with no obstruction. The esophagoscope shows

no pathological changes. The X-ray shows a delay in propelling the food.

Treatment consists chiefly in improving the general condition. The food should be nourishing and given in purée form for a few weeks.

Esophageal Eructation

sometimes occurs in hysteria as the result of swallowing air and may continue for hours, and is of an expulsive character.

Treatment.—Order patient to suppress eructation, also not to swallow air, which is best accomplished by having patient a few times daily breathe with his mouth open for 10 minutes. Besides that, nervina. Sometimes introduction of esophageal sound is beneficial.

Esophageal Vomiting

occurs periodically in nervous persons and consists of increased esophageal secretion. The vomitus is light in color, mixed with mucus, neutral in reaction. Microscopically only mucus and some epithelial cells are seen.

Treatment of the general nervous condition. Locally, the use of the solid sound often gives immediate relief.

Diseases of the Stomach

Acute Gastritis

Acute gastritis is subdivided clinically and pathologically into (1) acute simple gastritis of afebrile type; (2) infectious, febrile gastritis; (3) toxic gastritis; and (4) phlegmonous gastritis.

The Afebrile Form

Etiology.—Dietary faults either in quantity or quality of food; excess in alcoholic beverages, ices and unripe fruit.

Symptoms.—Discomfort in the form of epigastric pressure or actual pain in the epigastrium, frontal headache or dizziness, nausea with or without vomiting, thirst, coated tongue and bad taste in the mouth; belching of unpleasant taste; as a rule constipation, seldom diarrhea.

Treatment.—The bowels ought to be emptied by divided doses

(up to 0.2) of calomel, to be followed by magnesia or castor oil. In excessive vomiting lavage may become necessary; as a rule, however, the vomiting subsides on temporary abstinence from food, hot or cold applications to the epigastric region, Priessnitz compresses, or counterirritation in the form of sinapisms to the epigastrium.

In our experience weak tepid alkaline solutions, prepared by adding

Natrii bicarb. puri 1.0
Natrii sulphur. sicci 0.5
Natrii phosphor. sicci 0.4
F. pulv. No. 1.

to a cup of warm water, to be sipped slowly every 3 to 6 hours are beneficial.

Sometimes it is necessary to resort to the use of cocain (0.005 to 0.01) or bismut. subnitr. (0.3).

The most important procedure is the dietary treatment. Abstinence from food for the first 24 to 36 hours is necessary. Patient is allowed only weak tea, fresh spring water; certainly no milk in any form; later, diluted milk with tea or water; or peptonized milk; bouillon and well-strained barley soup for another day or two; gradually egg albumen, a little scraped beef, toast, zwieback and cereals are allowed, until finally a more liberal diet is proceeded with. As a rule, the patient may go back to his general diet after 8 to 10 days, but should be ordered to keep away from irritating food like spices, alcohol, etc., for a few weeks.

Infectious Febrile Gastritis

Since bacteriology has demonstrated the paratyphoid bacillus and its subdivisions, the term "gastric fever" has been discarded. It cannot be denied, however, that bad food may cause infectious gastritis associated with fever by reason of its infectious material.

Etiology.—Decomposed meats, the odor of which has been disguised by preparations, as is done in some restaurants; raw and spoilt milk; unripe or decomposed fruit; ices and contaminated water.

Symptoms.—The attack starts with a chill, followed by high temperature (103° to 104° F.), severe headaches, marked epigastric

distress, nausea and vomiting. The process usually spreads to the lower part of the gastro-intestinal tract with symptoms of abdominal cramps, obstinate constipation and slight distention of the abdomen.

Treatment.—Rest in bed, icebag to the head, frequent cold sponge baths and Priessnitz compresses to the abdomen. Otherwise follow the procedure as outlined for the afebrile form, except that the dietary regime must be still stricter and carried out for a longer time than in the afebrile form.

We have often found it advantageous to combine the initial dose of calomel with Nov. aspirini (0.75) to relieve the general symptoms.

Toxic Gastritis

Etiology.—The result of accidentally or intentionally taking of poisonous drugs.

The *symptoms* depend upon the poisons taken.

The *treatment*, except in cases of severe caustics, indicate lavage of the stomach, soothing drinks and the proper antidote.

Phlegmonous Gastritis

is a very rare disease and, pathologically, consists in a suppuration between the submucosa and the muscular layer of the stomach. It usually terminates fatally by giving rise to general septicemia and suppurative peritonitis. It may be idiopathic or metastatic.

Treatment is symptomatic. Icebag, stimulation, and morphin to relieve the pain. If signs and symptoms point to an abscess, surgical interference becomes necessary.

Two rare forms of acute gastritis are

Diphtheritic Gastritis by Extension and the Parasitic Form

The latter has been observed by *Gerard*,[2] *Senator*,[3] and *Schlesinger*.[4]

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[2] Jenaer med. Zeitsch., Vol. IV, p. 522.
[3] Berl. klin. Wochensch., 1890, No. 7.
[4] Münch. med. Wochensch., 1902, No. 40.

Treatment.—First treat the underlying cause and institute gastric lavage.

Chronic Gastric Catarrh

The term "Gastric Catarrh" used to be loosely applied to all gastric disturbances without consideration of the actual pathological condition.

Von Leube [5] was the first to point out that chronic gastric catarrh as a primary disease of the stomach is not very common.

By chronic gastric catarrh is understood a pathological condition varying from a mild change of the gastric epithelium to parenchymatous and interstitial changes with mucus formation, and finally to a complete glandular destruction. Aside from the constant presence of mucus in the stomach contents, there may also be changes of the active ferments.

Etiology.—This disease may be primary or secondary.

Primary.—As a result of acute gastritis; abuse of alcohol and tobacco; improper mastication; continuous abuse of diet as to quality and quantity and time of eating.

Secondary.—As a result of stasis due to disease of the circulatory system (heart, liver, kidney, lungs); metabolic diseases; as sequels to local affections of the stomach proper (carcinoma, ulcus); very frequently associated with tuberculosis of the lungs and other parts of the body; chronic malaria; very often as a result of anemia, particularly pernicious anemia. *Grawitz* even goes so far as to assert that achylia gastrica is the underlying cause of pernicious anemia due to a poison produced in the intestine from faulty digestion of proteids, such poison having a destructive action on the blood.

Subjective symptoms, as a rule, are not characteristic enough to make a diagnosis of catarrh of the stomach. The diagnosis is entirely dependent upon the examination of the gastric contents and feces. According to the findings of the gastric contents we differentiate:

Simple Gastric Catarrh

Examination of the gastric contents shows: Acidity normal;

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[5] *Von Ziemssen's* Handb. Spez. Pathol. u. Ther., Vol. VII, p. 58.

pepsin and rennin present, motility not disturbed, but mucus in small quantities macro- and microscopically visible.

Patient in this condition begins to be sensitive to certain articles of food; even regular smoking will affect his digestion.

The treatment consists in giving the patient, in the morning on an empty stomach, about 200 to 300 gm of warm Karlsbad-Mühlbrunnen to soothe the mucous membrane and wash away the mucous secretion, i.e., a self-lavage. The water may be given twice daily, but not for longer than four weeks. The most important part of the treatment is the regulation of the diet, which should be mixed and well nourishing, excluding spices and fats of high melting point. Alcohol should be discontinued entirely for a short time and then restricted to light wine or pure cognac in small quantities. Smoking should also be restricted.

Gastritis Chronica Mucosa

Gastric findings: Acidity slightly reduced; pepsin and rennin normal; mucus in large quantities both on an empty stomach and after ingestion of test meal.

There may also be slight disturbances of motility.

The subjective symptoms are more marked, consisting in foul taste, coated tongue, epigastric pressure, but no pain, nausea, eructations, and in some cases the so-called gastric cough terminating with a little vomiting of mucus, especially when the stomach is empty.

The treatment in these cases consists in ordering the patient to take 300 to 400 gm of Karlsbad-Mühlbrunnen twice daily for four weeks. Diet almost the same as mentioned above, with the exception of a still more restricted selection for the first two weeks. Meat in small quantities, roasted chicken, lamb, sweetbread, pigeon and fish. In more protracted cases it may be necessary to wash out the empty stomach, a few times, daily until the symptoms disappear.

If, in rare conditions, Karlsbad water alone is not sufficient to effect a cure, it may be followed by astringents in the shape of bismut. salicyl. 0.5, 3 t.d., given before meals in ½ tumblerful of water.

Gastritis Chronica Subacida

Result of examination of stomach contents: Mucus on an empty stomach and after ingestion of test meal. Total acidity diminished (20 and less). The motility is impaired. The symptoms do not differ much from those described above.

As to the dietary treatment, meat is not allowed at all for one week or more, after which meat should be given in minced form, also soft boiled eggs and fish; vegetables in purée form (potatoes, green peas, spinach, string beans, carrots, asparagus tips), cereals, bread in form of toast and zwieback, light puddings. Of fats, butter and cream may be given. Kissingen, Tarasp, Vichy, are the mineral waters to be used for 3 to 4 weeks.

Gastritis Chronica Acida

The most characteristic feature lies in the findings of the contents of the stomach, both empty and after a test meal.

In the empty stomach there is hypersecretion of gastric juice (no stagnation), plus the constant presence of mucus. Total acidity after the test meal is very high (80 to 90).

Microscopically, there are fragments of glands or nuclei of disintegrated cells.

The disease is rare and possibly the early stage of so-called atrophic catarrh in the period of increased gastric secretion.

The most characteristic symptoms are: Loss of appetite, pyrosis, sour regurgitation, sour vomiting mixed with mucus on an empty stomach. Pain is not common and, when present, is diffuse over the entire epigastrium and relieved on pressure. The symptom complex differs from that of ulcer of the stomach in that the pain is not so severe, not strictly depending upon meals. Furthermore, there is always mucus, never occult blood.

Treatment.—In this affection the Karlsbad-Mühlbrunnen is still more indicated; quantities of 300 to 400 gm are taken warm, 1 hour before meals, 2 to 3 t.d.

As to drugs, the alkalines are very effective in these cases and should be given in combination, as mentioned in a previous chapter.

The combinations of alkalines used are natrii bicarb., bismut. subnitr. or carbon, calcium carbonicum. Belladonna as extract or its alkaloid, atropin, in combination with the alkalies. Taka-diastase (0.5) aids here in the digestion of starch. In fermentation, bismut. salicyl. or resorcin is indicated.

A few lavages of the stomach often give relief to the symptoms.

Diet.—Experience teaches that meat is not very well borne in these cases, although there is hyperacidity. Liquid fats, carbohydrates and sugar are best borne. A diet list for such cases would be as follows:

Breakfast.—One-half litre of warm, boiled milk with a tablespoonful of lime-water; or ½ warm milk and ½ warm sweet cream, making ½ litre, or cocoa with sweet cream.

One or two soft boiled eggs, 30 gm butter, 50 gm of toasted bread or zwieback.

Dinner.—Barley—butter—soup, strained; fish twice a week; meat, if given, in small quantities and as white meats.

Vegetables mashed; potatoes 50 gm, carrots or spinach.

Cereal pudding (farina, rice, sago). Apple purée or prune purée.

As table water: Celestins, Vichy, Saratoga, a wineglassful.

At 5 P.M.: One cup of milk with lime-water; 50 gm of zwieback and 30 gm of butter.

Supper.—Like breakfast, except that a change may be made, as the condition improves, to scraped cooked ham and to cereals or puddings.

Prohibited are: Spices, oranges, lemons, macaroni, noodles, beans, lentils, cauliflower.

Gastritis Chronica Anacida

Examination of the stomach contents shows: Mucus; no free acid; pepsin and rennin present. The mineral waters in these cases are the warm springs containing sodium chloride, Baden-Baden, Wiesbaden—taken one hour before meals, 2 to 3 t.d., 300 to 400 gm.

In this form of gastric catarrh hydrochloric acid dilute in combination with pepsin, taken with the meals, is very efficacious

and may so stimulate the gastric glands as to bring back the free acid. The bitters work as appetizers. Alkalines, in combination with bismuth, given before meals, are also beneficial.

The diet will be described when treating of achylia gastrica.

Achylia Gastrica (Einhorn-Martius); Adenia Gastrica (Ewald)

The stomach contents contain, as a rule, no mucus; never hydrochloric acid and no pepsin or rennin. The test-breakfast comes back almost unchanged.

In this affection, as well as in the anacid type, the so-called gastrogenic diarrhea is very frequent, due to the proteids reaching the intestine undigested. The stools show muscle fibre and connective tissue in considerable quantities.

In anacid gastritis and achylia, the stomach empties itself very quickly, owing to the patent pylorus.

That intestinal digestion can well replace gastric digestion is clearly proven in anacid stomach and achylia. It is found, however, that the predigestion of proteids is impeded and, as a general rule, it may be said that we should restrict eggs and meat as much as possible and give carbohydrates and vegetables; fats in small quantities.

Alcohol in the form of brandy or whiskey before meals stimulates the appetite for the same reason bitters may be given. (Tr. Nux vom., gtt x, or Ext. fl. Condurango, gtt xx, or Ext. fl. Colombo, gtt xx, or Tr. Cinchonia, ½ teaspoonful, or in combination as explained in a previous chapter, p. 93.)

Saline mineral waters are not effective in these cases.

Following are two diet lists:

For Anacida, with meat:

Mornings:	200	gm	water cocoa
	15	gm	butter
	50	gm	toast
Noon:	150	gm	poultry
	200	gm	rice purée
	200	gm	pudding
	50	gm	apple purée

5 P.M.:	200 gm	buttermilk, or yoghurt, or kephyr
	50 gm	zwieback
	15 gm	butter
Evenings:	200 gm	macaroni or noodles
	50 to 100 gm	compot
	50 gm	zwieback
	15 gm	butter
Before retiring:	150 gm	buttermilk

Without meat:

Mornings:	200 gm	milk cocoa
	100 gm	zwieback
	15 gm	butter
	200 gm	barley soup
Noon:	200 gm	rice purée
	200 gm	pudding
	100 gm	apple purée
5 P.M.:	200 gm	buttermilk
	100 gm	zwieback
	30 gm	butter
Supper:	200 gm	barley soup
	200 gm	noodles
	100 gm	prune purée
	50 gm	zwieback
	20 gm	butter

As condition improves, these diet lists are subject to change.

Orange juice on an empty stomach is very beneficial in these cases; so is hydrochloric acid in combination with pepsin after meals.

Formula:

Acidi mur. dilut., Pepsini puri,	āā	5.0 to 10.0
Aquæ		100.0

S. One teaspoonful in a tumbler of water, to be taken with the meals through a glass tube.

Calcium citrate and calcium phosphate in teaspoonful doses are beneficial in anacidity and achylia gastrica (*Boas*).

A form of achylia gastrica described by *Martius*,[6] which he calls the congenital type, we believe to be a neurotic type; it occurs

[6] Achylia gastrica, ihre Ursachen und Folgen, Leipzic, 1897.

often in the climacterium and is associated with neurasthenia and hypochondria.

As to gastric catarrh secondary to other diseases, it is necessary to treat the underlying cause.

The prognosis of chronic gastric catarrh depends upon the anatomical changes.

Simple gastric catarrh, if treated properly, will be entirely overcome. The same may be almost said of subacid gastritis and gastritis mucosa chronica. While in anacid gastritis and gastritis acida proper treatment will afford great relief, restoration to normal cannot be expected.

Achylia gastrica will also be benefited by careful treatment, but some cases are not amenable to the best efforts of treatment, owing to lack of assimilation of food.

Achylia Pancreatica

O. Gross [1] calls attention to the fact that achylia gastrica, associated with diarrhea, is really an achylia pancreatica due to a functional disturbance of the external secretion of the pancreas.

In order to justify such a diagnosis the absence of trypsin in the stools, demonstrated by his casein method, is essential.

Method

Solution: 0.5 casein to 1 litre of 0.1% soda solution.

Test meal: Scraped beef, to which is added 0.3 carmin in order to recognize the stool by the color.

Test: To 10 cc rubbed up feces are added 100 cc of the casein solution and put into incubator. From time to time a few drops of 1% of acetic acid solution are added to test whether there is still cloudiness.

In the presence of trypsin cloudiness ought to disappear on the addition of acetic acid, in from 6 to 30 hours, showing that the casein has been entirely digested.

The method, while fairly reliable, also proves the presence of erepsin, an intestinal ferment demonstrated by *O. Cohnheim*. In order, therefore, to demonstrate the presence or absence of trypsin

[1] Münch. med. Wochenschr., 1912.

exclusively, the *Mett* albumin-tube method for pepsin (see page 12) can be utilized. But instead of using HCl, as for the pepsin method, we use here the 1% soda solution. Either the feces or, still better, the duodenal contents obtained by the *Gross* duodenal tube, are treated with a soda solution, and into this is placed a *Mett* albumin tube and put into an incubator at 100° F. Normally the albumin is digested within 24 hours.

O. Gross emphasizes that pancreon, in the doses of 0.5 3 t.d., acts as a specific in achylia pancreatica.

Ulcus Ventriculi

The various attempts at explaining the origination of ulcus ventriculi have not yet quite elucidated the subject, and it will suffice to briefly mention the theories most generally accepted.

Since *Virchow*, the theory of circulatory disturbance of the gastric mucosa is still accepted by many authors, as autodigestion of any portion of the gastric mucosa could hardly be explained otherwise. Likewise ulcers of embolic and traumatic origin would be thus explained.

Chemical and mechanical irritation may cause ulcer.

Türck [7] produced experimentally ulcers by feeding bacterium coli to animals. *Riegel* [8] was the first to call attention to the fact that ulcus ventriculi is often associated with hyperacidity, from which he deduced that superficial erosions cannot heal and therefore tend to ulceration. Furthermore, although there are cases of subacidity or anacidity associated with ulcer, we may still agree with *Lindner* [9] who suggests that originally there was hyperacidity, but patients, when first seen, were already in such a condition that acidity had either diminished or entirely disappeared.

Lindner also advanced the theory that ulcer of the stomach may be of an infectious nature and in favor of his argument proved that it is frequently found in individuals suffering from tonsillitis rheumatica and endocarditis rheumatica, and pointed out the coincident periodicity of the symptoms of gastric ulcer and rheumatism.

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[7] Zts. f. exper. Pathol. u. Ther., Vol. VII.
[8] Zts. f. klin. Med., Vol. XI, No. 1.
[9] Münch. med. Wochensch., 1912, No. 10.

The female sex is said to be more often affected than the male, but this is not borne out by American statistics.

Anemia and particularly chlorosis have been mentioned as a frequent cause. Occupation is considered a factor (cooks and shoemakers).

Usually there is only one ulcer, very rarely two, but cases are recorded in the literature where as many as five ulcers were found in the stomach. The most frequent location is the posterior wall of the stomach near the pylorus; next in frequency are the lesser curvature, the pylorus, the anterior wall, the greater curvature and cardia, in the order named.

The mortality was given by *von Leube* as 2.4%, but this is undoubtedly too low. *Hewes* [10] had 1 death in 51 cases medicinally treated, but in 36% the symptoms recurred.

James W. Russell,[11] having followed statistics for 2½ to 13 years after treatment, found the following figures:

2.1% died of hemorrhage and perforation of the stomach;
4.3% died of an intercurrent disease;
42.6% were completely healed;
14.9% were cured after several recurrences;
27.7% cured after one hemorrhage;
44.7% had still symptoms;
14.9% had intermittent pains;
29.8% penetrating pains;
6.4% findings doubtful.

L. Bamberger found 70% cured, 25% recurrences, and a mortality of 5%.

Complications of Ulcer

Penetrating ulcer going deep to the serosa of the stomach and causing local peritonitis (perigastritis); adhesions with the neighboring organs which may give rise to contraction around the pylorus and so may lead to pyloric stenosis and gastrectasia.

Perforation of the stomach, mostly in the anterior wall, with peritonitis, or perforation posteriorly, giving rise to subphrenic abscess; may also perforate into the neighboring organs, such as the heart, pleura, transverse colon, portal vein (pyelophlebitis).

[10] J. A. M. A., 1906, No. 11. [11] Lancet, Jan. 30, 1904.

Abscess into the bladder, secondary to perforation of the stomach, is described by *Wegele.*

Should an ulcer give continuous pain, or even be the cause of frequent minute hemorrhages, pernicious anemia may result.

The course of gastric ulcer varies.

A superficial ulcer may heal permanently, while deep-seated ulcers or such that extend over a large area will lead to constriction.

Constrictions in the continuity of the stomach cause hour-glass contraction of the stomach.

Old ulcers with infiltrated margins, especially when the infiltration is the result of a plastic peritonitis, may be mistaken for new growths, as they show the same resistance on palpation (callous ulcers). The latter may degenerate into carcinoma.

Erosions of the stomach are, according to *Einhorn,* to be considered as an independent disease, resulting from toxic influences like uremia, eclampsia and appendicitis, and chiefly characteristic for particles of mucous membrane being found in gastric lavage, with varying acidity.

The subjective complaints are those of dyspepsia with marked loss of weight.

Many authors, particularly *Riegel,* do not consider it an independent affection, but class it as gastritis exfoliativa. On the other hand, however, it is likely that these solitary erosions are preliminary stages of ulcera.

Symptoms

(1) *Pain.*—The pain usually occurs ½ to ¾ of an hour after meals, is localized in the epigastrium, at times radiating to the back; it is most severe at the height of digestion (2 to 3 hours after meals); ingestion of soft, nourishing food, particularly milk, relieves the pain. Sometimes the pain may be very severe when the stomach is empty (hunger pain), and frequently the attack terminates with regurgitation of sour food, or even vomiting.

(2) *Hyperacidity and Hypersecretion.*—Hyperacidity is present in a great number of cases; however, cases of ulcer exist with normal or subacidity. Hypersecretion is still more frequent than hyperacidity.

(3) *Hematemesis* occurs in some cases of gastric ulcer, with

the following characteristics: It is preceded by nausea; the blood is usually dark and, as a rule, of acid reaction, often mixed with stomach contents. While hematemesis is a very important clue to the diagnosis of gastric ulcer, care should be taken not to mistake it for hemoptosis, which, in contradistinction, is of a bright red color, mixed with air bubbles, and always alkaline. The blood of pulmonary origin may be swallowed and then vomited back. The diagnosis in these cases can only be made after a careful history and examination.

Blood due to varicose veins in the esophagus may be mistaken for ulcer; the guiding point is the etiology of the varicose veins (atrophic cirrhosis of the liver and circulatory disturbances).

Vicarious hematemesis in amenorrhea must be differentiated from ulcus ventriculi. Splenic anemia (pseudoleukemia), hemophilia, and bleeding from other sources, like nose or throat, should also be considered in the differential diagnosis.

The term "Charcot's bleeding" signifies a hemorrhage in hysterics, without any anatomical lesion. As a matter of caution, however, it is necessary for the physician to convince himself of the nature of the vomitus in hysterics.

(4) *Occult Blood* is one of the most important symptoms of ulcer of the stomach. It cannot be too strongly emphasized that it is necessary to frequently examine the feces for occult blood after a three days' meat-free diet, and excluding fissures, bleeding hemorrhoids and blood from other parts of the intestines. Occult blood should also be looked for in the stomach contents.

For a description of the methods of examination for occult blood, see p. 15.

In some cases there is melena (black stools due to decomposed blood) as a symptom of abundant bleeding in the stomach.

(5) The *Pressure Pain* in the epigastrium and the zone pointed out by *Head* correspond to a triangular space at the left of the epigastrium.

The *Boas* pressure point is between the 10th and 12th dorsal vertebræ at the left.

In localizing an ulcer, we may sometimes be guided by the position in which the patient is most uncomfortable. Thus, it was found that, with ulcer of the pylorus, the patient has most pain

when lying on the right side; in ulcer of the posterior wall, when on his back; in ulcer of the anterior wall, when lying on the abdomen.

Other symptoms which, however, are not characteristic are the following: Patient is afraid of eating on account of pain, although his general appetite is good. Sometimes the appetite is diminished, especially when the affection is associated with a secondary gastritis.

The tongue is usually clean.

Pyrosis may be a constant or the only symptom.

The general appearance of the patient changes. In repeated hemorrhages patient becomes anemic, but not cachectic, unless the ulcer degenerates into a carcinoma. On palpation, the above-mentioned pressure points are found to be present in some cases. By light hammer percussion it is often possible to localize the most sensitive spot.

A palpable mass is present only under the following conditions:

(a) Where there is a thickened base of the ulcer and indurated margins.

(b) When the ulcer forms a localized perigastritis by adhesions.

(c) Pylorospasm and hypertrophic pylorus.

(d) Rare cases where perforation through the front wall have resulted in abscess.

The diagnostic value of the X-ray in ulcer of the stomach is described in Chapter XI.

According to *Elsener*, the gastroscope aids in the diagnosis of ulcer of the stomach.

Atypical Cases of Ulcer

(1) Ulcers are frequently found post mortem without having given any symptoms during life.

(2) Sometimes the only symptom found is hypersecretion.

(3) Hemorrhage may be the first symptom in ulcus ventriculi.

(4) Perforation may be the first of the symptoms.

(5) In a few cases the symptoms are those of gastritis chronica acida.

The diagnosis in some of these cases is made by taking in con-

sideration the history, the course of the disease, occult blood findings.

Differential Diagnosis

(1) In *Nervous Hyperacidity* the pain, as a rule, is not severe; there is continuous pyrosis; acidity undergoes great variations. At times there may be sub- or anacidity with symptoms pointing to hyperacidity due to hyperesthesia of the mucous membrane. *H. Strauss* has termed such cases anacida hyperacida.

(2) *Gastric Crisis* (Tabes dorsalis). The pupil and knee reflexes, as well as the presence of hypoesthesia, will clear up the diagnosis.

(3) From *Duodenal Ulcer* it is differentiated by the pain which occurs in duodenal ulcers 3 to 4 hours after meals; the pain is more to the right of the epigastrium. Occult blood is oftener present in the stool. Hunger pain and hypersecretion are more marked. In some cases there is slight jaundice on account of an extension of the inflammatory process, surrounding the ulcer, to the papilla Valerii.

(4) From *Cancer of the Stomach* it is differentiated by the anacidity, presence of lactic acid and of the *Boas-Oppler* bacillus.

Elsener points out that to differentiate between an ulcer and its malignant degeneration, it should be observed that, in the former, treatment has a favorable influence on all the symptoms, especially on occult blood, which is not the case in malignancy.

(5) From *Cholelithiasis.* The pain is in the right of the epigastrium, radiating up to the right shoulder. Its onset is not dependent upon meals; taking of food does not relieve the pain. It usually terminates with greenish vomiting and is followed by some jaundice. The presence of biliary constituents in the urine and the examination of the feces will aid in the diagnosis.

(6) In *Chronic Pancreatitis* the pain is less severe, but more continuous; light-colored voluminous stools are present. Trypsin is diminished or absent. The feces show microscopically neutral fat, fatty acid crystals and muscle fibre.

(7) From *Chronic Appendicitis,* by the absence of occult blood in the stools, tenderness of *McBurney's* point; irregular pain.

Treatment

The treatment of ulcer of the stomach has to meet two indications: (1) to bring about a cure by a bland and restful diet and (2) to treat the complications, the first and most important of which is hemorrhage of the stomach.

When hemorrhage occurs, patient must be put to absolute rest; total abstinence from food for 4 to 5 days; even nutritive enemas should not be given in the first 24 hours, because they reflexly excite peristalsis in the stomach. The *Murphy* drop method of normal saline, or subcutaneous injections of normal saline solution will tend to replace the fluids to the body and to strengthen the heart.

Van der Velden [12] recommends the injection of 5 gm of a sterilized 10% sodium chloride solution intravenously, as a hemostatic.

Gelatin, as obtained in *Merck's* sterile tubes in 10 cc doses intramuscularly, serves the same purpose. Ergotin and adrenalin are doubtful as hemostatics in hemorrhages of the stomach.

In gastric hemorrhage the serum ought to be tried. It can be used either from a donor whose blood has been tested for hemolysis, or rabbit or horse serum may be used.

In case of collapse, camphor and ether as well as caffein are to be used hypodermically. In desperate cases lavage of the stomach with ice-cold water or a 2% solution of iron chloride in hot water may be tried.

After hemorrhage has ceased for 2 to 3 days, rectal feeding may be started. On the third day, before beginning with the rectal feeding, it is well to follow the advice of *Tripier* [13] to give 3 hot enemas daily of ½ litre of hot water with the addition of 2 gm of calcium chlorid to each enema, and during that time gelatin, by mouth, may also be tried.

Decoct. gelatini puri 15:150
S. One tablespoonful every 2 hours, to be warmed before using.

After the third day, nutritive enemas, 3 t.d., should be given according to the formula mentioned on p. 75. Such treatment

[12] Deutsche med. Woch., 1909, No. 5. [13] Bull. med., 1898, No. 45.

should be adhered to from 8 to 10 days. *Boas* describes obstinate cases where he had to use the nourishing enemas for three weeks.

The general condition of the patient must be thoroughly watched and the mouth kept very clean to prevent parotitis. We should also strictly watch for acetonuria, the presence of which would indicate that starvation has been carried to the extreme. An icebag to abdomen for the first 2 or 3 days is indicated. Morphin, hypodermically, may be necessary to relieve the anxiety of the patient.

This strict observation of exclusive rectal feeding for 8 to 10 days is only necessary in very severe hemorrhage; as a rule, as early as the fifth day tablespoonful doses of grape-sugar solution, ice water, cold tea and cold milk may be given in addition to the rectal feeding.

In treating an ulcer without hemorrhages, the rectal feeding is only kept up for three days and, according to *von Leube*, a rest in bed for 4 weeks is essential, with hot flaxseed poultices to the abdomen twice daily for two hours, and a Priessnitz compress for the night.

After the rectal feeding, *von Leube's* treatment is divided into four forms of diet: (1) Bouillon, beef-tea, milk, soft boiled and raw egg, zwieback (unsweetened) and water, non-sparkling alkaline table water (Celestins, Biliner).

(2) Boiled calf's brain, sweetbread, chicken, pigeon, tapioca boiled in milk, calf's feet gelatin.

(3) Scraped loin of beef, scraped raw ham, mashed potatoes, toast, small quantities of coffee or tea with milk.

(4) Roast chicken, pigeon, hare, roast beef, fish, macaroni, rice, light pudding and a little wine.

While the greater part of *von Leube's* treatment of ulcer of the stomach can be adhered to, it is advisable to exclude bouillon, beef-tea, coffee and wine from the dietary list.

According to *Ad. Schmidt*,[14] raw meat ought not to be allowed, as the connective tissue fibres would overtax the secretory function of the stomach. On the other hand, it is advisable to include in the first period warm sweet cream, ¼ litre daily, almond milk, or 3 tablespoonfuls daily of pure olive oil, if the patient can tolerate it.

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[14] Deutsche med. Wochensch., 1906, No. 47.

Generally speaking, the diet in ulcus treatment may be outlined as follows: In the first week following abstinence from food, liquids by the spoonful or in sips; in the second week, every 2 hours alternately a cup of milk with Nestlé's food, or strained barley or with thin farina.

In order to add to the nutritive value, plasmon or nutrose may be added. Soft boiled eggs, 2 or 3 daily.

Toward the end of the second week, tapioca or cocoa or tea to the milk may be allowed.

In the third week, sweetbread, roast chicken or pigeon, calf's feet gelatin, in addition to the articles mentioned before.

Nutritive enemas are given in the second week at the rate of two per day, in the third week one daily, after which they are stopped altogether.

The diet in the third week of treatment of ulcer of the stomach should consist of:

First breakfast: 250 gm of milk and tea and 3 zwiebacks.

Second breakfast: 250 gm of milk farina with one soft boiled egg.

Dinner: A roast pigeon, 150 gm of mashed potatoes.

3 P.M.: 250 gm of milk with tea.

5 P.M.: One soft boiled egg.

7 P.M.: 250 gm of strained barley soup with the yolk of an egg.

9 P.M.: 250 gm. of milk and 2 zwiebacks.

Thirty gm of plasmon is added during the day.

Fourth week: 20 gm of butter is added to the breakfast and supper; for dinner, beefsteak and a wineglass of sweet cream daily are allowed; also purée of spinach, string beans and the tips of asparagus.

Fifth week:

Mornings:	250 gm of milk with tea or cocoa
	Soft boiled egg
	30 gm of zwieback
	20 gm of butter
10 A.M.:	250 gm of milk-soup
	1 soft boiled egg
	30 gm of zwieback
Dinner:	150 gm of fillet
	150 gm of rice milk

3 P.M.:	250 gm	of milk and cocoa
	30 gm	of zwieback
	20 gm	of butter
6 P.M.:	1	soft boiled egg
8 P.M.:	150 gm	of cold meat
	150 gm	of milk-soup
10 P.M.:	250 gm	of milk
	2	cakes

Sixth week:

8 A.M.:	250 gm	of milk cocoa
	50 gm	of white bread
	20 gm	butter
	1	soft boiled egg
10 A.M.:	100 gm	of cold meat
	50 gm	of toast
	20 gm	of butter
	150 gm	of milk, or 50 gm of cream
Noon:	150 gm	of roast veal
	100 gm	of spinach
	50 gm	of mashed potatoes
	100 gm	omelet soufflée
	50 gm	compot
4 P.M.:	200 gm	of milk cocoa
	30 gm	of zwieback
	20 gm	of butter
6 P.M.:	150 gm	of milk
8 P.M.:	150 gm	of cold meat
	2	scrambled eggs
	50 gm	of toast
	20 gm	butter
10 P.M.:	150 gm	of milk

Of course, the dietary progress should be individualized; in some cases the quantity may be increased more rapidly, while in others it may have to be diminished.

When marked hyperacidity persists, larger quantities of sweet cream and eggs should be given.

Lenhartz [15] advises even the first day after the hemorrhage 200 to 300 gm of milk and 1 to 3 eggs daily; and after the sixth day large quantities of milk, eggs and scraped beef, with the idea that

[15] Münch. med. Wochensch., 1904, No. 1.

this concentrated diet will overcome the anemia and so aid in healing the ulcer.

In our opinion, a modified *Lenhartz* diet, as described above, is the best method of treatment.

DRUGS

Karlsbad water, in the form of Karlsbad-Mühlbrunnen, 300 gm taken warm on an empty stomach, has a soothing influence on the gastric mucosa, and by virtue of the alkalines it also reduces gastric acidity. It can be taken twice daily for 3 to 4 weeks.

The *Fleiner* bismuth treatment of persistent gastric ulcer, which consists in introducing a bismuth solution into the stomach by means of the stomach tube, can be replaced by giving the patient 10 gm of bismuth in 300 gm of Karlsbad water.

The aluminum preparations *Eskalin*, which is an aluminum glycerin paste, and *Neutralon*, an aluminum silicate, are recommended, the former for hemorrhages and the latter for hyperacidity.

Another drug, recommended by *Gerard*,[16] is silver nitrate in doses of 0.1 to 0.3 to 0.5: 180.0 3 t.d., 1 tablespoonful before meals, until 5 bottles have been used. Diarrhea, which sometimes occurs in the beginning of the treatment, soon disappears. Another drug that we would recommend is the liquor ferri sesquichloridi, also recommended by *Bourget*. We use it in the formula:

Liquor ferri sesquichloridi	6.0
Glycerini	10.0
Aquæ	140.0

S. One tablespoonful 3 times a day after meals in a wineglassful of water taken through a glass tube.

This drug proved to be very beneficial in certain cases of anemia with hyperesthesia of the stomach, frequent vomiting and pain in the left hypochondrium, simulating gastric ulcer—which, however, improve in one or two weeks after the administration of liquor ferri sesquichlorati in addition to the modified *Lenhartz* diet for ulcus ventriculi and rest.

[16] Deutsche med. Wochensch., 1888, No. 18.

A very important addition to the treatment of ulcer of the stomach is the oil treatment outlined by *Walko*.[17] The oil has a soothing and protecting effect on the mucous membrane of the stomach, is besides a nutritive and aids in overcoming constipation. He gives 15 to 50 gm of olive oil 3 t.d. shortly before meals, or 100 to 200 gm by the stomach tube. As a rule, 1 to 3 tablespoonfuls 3 t.d. are found sufficient.

Whether the stomach tube is permissible in ulcer of the stomach is still a disputed question. *Boas*, *Flade*[18] and *Riegel* oppose its use, except where the ulcer is complicated with dilatation of the stomach. *Fleiner* and *Bourget*, however, use it when indicated. *Bourget* washes the stomach immediately after a hemorrhage with a 2% iron solution, followed in five minutes by a potassium bicarbonate solution.

Wiel recommends ice-water lavage as a hemostatic, and *Ewald* hot water.

For pylorospasm and in continuous hypersecretion, subcutaneous injections of atropin are advocated by *Tabora*,[19] 3 t.d. 0.0001 from 4 to 10 weeks. Belladonna may be used instead in the form of suppositories 0.03 or by mouth as extract 0.015.

If these drugs should cause dryness of the throat or other poisonous symptoms, their use should be discontinued.

In all cases of ulcer of the stomach, caution in diet ought to be observed for years, as recurrence of the symptoms is not infrequent. Raw fruit, salad, sour and spicy food, rye bread, cabbage, bouillon and liquors should be prohibited.

Those who can afford it should take a four weeks' cure at Saratoga, Karlsbad, Vichy, Neuenahr; otherwise the cure should be taken at home.

Ulcers of syphilitic, tubercular or actinomycotic origin are very rare and, if they do occur, should be treated according to the underlying cause.

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[17] Centralb. f. innere Med., 1902, p. 1113.
[18] Münch. med. Wochensch., 1891, Nos. 32 and 33.
[19] Münch. med. Wochensch., 1908, No. 38.

SYMPTOMS OF COMPLICATIONS OF ULCER OF THE STOMACH

Perforation.—The onset is acute with severe pain in the region of the stomach, sometimes described by the patient as a sensation that something tore in the stomach. There is a marked distention of the abdomen, due to the escape of air and stomach contents, obliterating liver and splenic dulness. General peritonitis develops very quickly, usually within 10 to 12 hours in the majority of cases.

There is never vomiting, a characteristic point to which *Traube* first called attention.

It is very seldom that general peritonitis will not follow, and this is the case when perforation takes place on an empty stomach.

Perforation through the front wall may form a localized abscess anteriorly, which is diagnosed by the palpable mass and the septic temperature. Or it may perforate posteriorly, giving rise to a subphrenic abscess (pyopneumothorax subphrenicus, *Leyden*). There is flatness of the lower part of the chest and the characteristic three zones described by *H. Roth:* flatness below the diaphragm, an area of tympany above, and above this another area of flatness due to compressed lung tissue.

The septic temperature, the blood and aspiration will clear up the diagnosis.

The possibility of perforation taking place into other organs was already mentioned above.

The treatment is purely surgical.

Stimulation, morphin hypodermically and an icebag locally applied, will assist in overcoming the acute shock in case the operation cannot be performed at once.

Perigastritis as a complication is diagnosed with great difficulty. If repeated appropriate measures for gastric ulcer should remain without any influence, especially in regard to the pain, perigastritis should be suspected. In rare cases a localized resistance in the region of the stomach may aid in the diagnosis. The X-ray may likewise help. The treatment is surgical.

Pyloric Stenosis and *Ectasis* will be treated in a special chapter.

A very frequent and important complication is the so-called *Hour-glass Contraction* of the stomach. It is caused by cicatricial

tissue formation, localized either near the pylorus or in the median line, or sometimes near the cardia.

The cicatricial tissue divides the stomach into two compartments which communicate with each other by a canal of varying size.

The diagnosis is aided by the history and by inflation of the stomach, which shows the organ divided into two compartments. Another aid in diagnosis is lavage of the stomach by the sudden reappearance of food particles after the lavage water has returned clear before.

A most important and decisive aid in the diagnosis is repeated X-ray examination showing always the constriction at the same place.

Treatment is surgical.

CARCINOMA VENTRICULI

Etiology.—The primary cause of carcinoma of the stomach, like carcinoma in other organs, is not known.

Carcinoma of the stomach is a primary disease and occurs with greater frequency in males than in females. Age is undoubtedly a factor; it occurs between the ages of 40 and 70. Heredity seems to play an important part.

Previous gastric diseases, notably ulcus callosum, predispose to carcinoma, while the assertion that achylia gastrica predisposes to it has not been established. The same may be said of chronic gastritis.

The pathological varieties in accordance with their frequency are the scirrhous, medullary and gelatinous.

According to *Brinton*, the most frequent seat of cancer of the stomach is as follows:

Pylorus	60%
Lesser curvature	20%
Greater curvature	10%
Cardia	10%

General Symptomatology.—The early subjective symptoms of cancer of the stomach are vague and not characteristic. They are mostly those of dyspepsia, such as epigastric fulness, pressure, burning, belching and persistent loss of appetite. If a patient, pre-

viously in perfect health, suffers from sudden anorexia which does not yield to treatment, suspicion of carcinoma ought to be awakened. Pain is not an early symptom; it is only in the later stages of the affection that pain may assume a severer form. Pain is more marked when secondary to ulcus ventriculi.

Vomiting and regurgitation are frequent symptoms of carcinoma of the stomach, the severity of which depends upon the location of the cancer. The character of the vomitus is usually that of food, but with excessive strain there will be bilious vomiting.

Hematemesis is a late symptom; it occurs when the cancer ulcerates and has the character of coffee-ground vomitus, is of alkaline reaction, mixed with food particles, and, on microscopic examination, some claim to be able to differentiate the cancer cells.

Bloody stools (melena) are an important, though not very frequent symptom. A more important and very early symptom is occult blood in the stools, especially so when repeatedly found after a meat-free diet of 2 to 3 days' duration and other sources of bleeding can be excluded.

Examination of the stomach contents is also an important guide to make a diagnosis of carcinoma. It usually shows diminution or absence of hydrochloric acid, presence of lactic acid and of the *Boas-Oppler* bacillus. Pepsin and rennin may be absent only at a late stage of the disease.

Disturbances in motility are also a very important and early symptom in the disease.

If a test meal is given at night with an addition of rice, raisins and prunes, with the skins, and aspirated the next morning from the fasting stomach, microscopical and even macroscopical food particles may be found.

Emaciation on account of anorexia and improper assimilation begins very early in the disease. Cachexia is usually a late manifestation of carcinoma ventriculi, but sometimes it begins early, especially in the medullary type, due to absorption of the toxins of the cancer cells and the breaking up of the body proteids.

The blood picture of carcinoma ventriculi, even in the early part of the disease, seems to incline to marked reduction of hemoglobin without a corresponding diminution in the red blood corpuscles. Vacuolization and poikilocytosis are marked.

Special Symptomatology.—If the carcinoma is localized at the *cardia,* an early symptom is the sensation of pressure in the region of the ensiform cartilage. There is at first some difficulty in swallowing hard food, later even soft food, and finally even liquids; there is early regurgitation of food, sometimes mixed with blood. Emaciation occurs early due to starvation.

On auscultation either over the epigastrium or to the left of the 12th dorsal vertebra, when the patient swallows food, a delay in the sound of swallowing and also a residual sound of swallowing can be heard. The squirting sound is also delayed on swallowing fluids and is heard even on dry swallowing. When the stomach tube is introduced, an obstruction is found about 40 cm from the teeth and, on removing the tube, there may be found a good quantity of mucus tinged with blood and, on microscopical examination of the blood, rarely onion-shaped cancer cells may be seen.

In trying to introduce the solid esophageal sound, obstruction at the cardia is also met with. As a rule, hydrochloric acid is absent in carcinoma of the cardia, and as it is often impossible to determine the existence of hydrochloric acid by means of the stomach tube, the Sahli dermoid capsule method (see p. 146) will be of assistance.

The palpability of the tumor is only possible if it extends to the lesser curvature and fundus. It is an irregular mass under the left costal arch, movable on inspiration and immovable on expiration. The esophagoscope sometimes aids in the diagnosis.

In the differential diagnosis in stenosis of the cardia there are to be considered (a) stenosis and scar formation as a result of peptic ulcer, which is very rare, (b) luetic stricture, and (c) nervous spasms at the cardia.

To differentiate it from scar due to an ulcer, the history, the age, the course of the disease, the presence of hydrochloric acid by the Sahli dermoid test, and the esophagoscope will help in the diagnosis.

For luetic stricture, the history of infection, other signs of syphilis, the Wassermann reaction and the therapeutic test will clear up the diagnosis.

From nervous spasms of the cardia: The changeability of the symptoms, the age, the possibility of overcoming the obstruction

with a larger-sized sound; the fact that the spasm can be overcome by means of atropin, and other nervous phenomena the patient may show, will aid in making the diagnosis.

The X-ray findings will also greatly assist.

Carcinoma of the *fundus* and the cardiac part of the lesser curvature may exist without any gastric symptoms: it is the loss of weight and the growing weakness that bring the patient to the physician who, on examination, is often surprised to feel a palpable tumor.

The size of the tumor varies from a walnut to a fist. It is movable on inspiration and immovable on expiration.

On inflating the stomach, the tumor can be made out to belong to the stomach. Examination of the stomach contents and the X-ray will be of assistance.

Carcinoma of the *posterior wall* of the stomach may be still more devoid of local symptoms than carcinoma of the fundus. Extreme anemia and cachexia are often the only symptoms that may lead to the suspicion of cancer of the stomach.

The diagnosis can be aided by the more modern laboratory methods advocated by *Salomon* (*Salomon's* test, p. 20), by *Fischer* and *Neubauer* (glycoltryptophan test, p. 18), modified by *Weinstein;* by the precipitin test (p. 19) and *von Aldor's* albumosuria test (p. 148).

Carcinoma of the Anterior Wall

The diagnosis is chiefly made by palpation, inflation, and examination of the gastric contents.

The most important and frequent seat of the carcinoma of the stomach is the *pylorus.* With cancer of the pylorus the earliest sign, aside from the general symptoms, is motor insufficiency, as shown by a test meal taken before retiring and aspirated the following morning, when stagnation may be found only microscopically; or after an *Ewald* test breakfast aspirated one hour after ingestion, when larger quantities will be found than expected: 120 cc and more; or after the *von Leube* test meal, to be withdrawn 4 to 6 hours after the meal; and the elaborate *Holzknecht* method by the X-ray. All of these methods will aid in arriving at an early diagnosis.

As the condition progresses, there are morphological changes of the entire stomach, giving rise to dilatation and ectasis. In these stages the stomach is never empty.

The secretory findings early in the disease may not differ much from the normal; later on, the acidity begins to diminish and finally is entirely absent (hypo- and anacidity). Lactic acid is present. The *Boas-Oppler* bacillus is found in large numbers. The flagella, described by *Cohnheim*, may also be found.

The gastric findings indicate the catarrhal changes associated with the condition.

In the early stage of the disease, palpation is negative. As the disease progresses, an immovable, palpable tumor of varying size is found. The differential diagnosis between benign and malignant stenosis of the pylorus as caused by a callous ulcer giving rise to a palpable tumor will be cleared up by the history of the case, general appearance of the patient, the gastric findings or by the gastroscope.

Differentiation of pyloric stenosis caused by pressure of tumor from the adjacent organs or by adhesions to other organs must be taken into consideration in making a diagnosis of carcinoma ventriculi.

The gastroscope as devised by *Elsener* promises to be an aid in the early diagnosis of this affection.

The two most important diseases of the stomach still to be differentiated are ulcer of the stomach and gastritis chronica anacida.

The differentiation from ulcer of the stomach was discussed under that heading.

Differentiation from gastritis anacida: Presence of lactic acid in carcinoma, more marked and progressive disturbances of motility, presence of the *Boas-Oppler* bacillus. *Von Aldor* lays great stress upon the presence of albumosuria, provided the patient has no fever.

The test is as follows:

To 5 cc of urine are added 2 drops of hydrochloric acid and then a 5% phosphor-tungstic acid solution, until a sediment forms. The fluid is poured off and the sediment treated with 4 to 8 cc absolute alcohol and centrifuged. The alcohol above colors yellow, due to the urobilin.

Alcohol is again added and centrifuged, until both alcohol and

sediment are clear. The alcohol is poured off and water added. This will give a blue color which disappears when shaken in the air. Now the *Biuret* test is made (treating with a dilute copper sulphate solution), and there will appear a rose-violet color.

The duration of carcinoma of the stomach is from 1 to 2 years. Cases are cited that terminated fatally in less than 6 months, while others have lasted longer than 2 years.

Treatment.—Carcinoma of the stomach, if at all operable, should be turned over to the surgeon. If inoperable, either by reason of greater involvement of the stomach proper, or owing to existing metastasis, internal treatment should be resorted to. This is purely symptomatic: hydrochloric acid and pepsin; fluid extract of condurango; lavage of the stomach, the frequency of which will depend upon the degree of stagnation. Methylene blue, radium and the X-ray treatment are all to be tried.

The diet should not be too strict; only in beginning with pyloric stenosis the food must be given in finely divided form or liquids. As stenosis becomes complete, rectal feeding may have to be resorted to.

Jejunostomy has been advised to prevent starvation, but it only serves to prolong the misery of the patient. In the late stages of the disease, sedatives should be administered on a liberal scale.

Sarcoma of the stomach is a very rare disease; symptoms and treatment are exactly the same as in carcinoma.

Tuberculosis of the stomach was mentioned before.

Another very rare disease of the stomach, where the entire stomach wall is studded with polypi, has been observed by *Wegele*. The diagnosis was made ad operationem.

CHAPTER IV

Change of Tone, Motility, Size and Position of the Stomach

It is to the credit of *Stoker* to have shown that the stomach exercises a so-called double motor function, namely, peristole and peristalsis. The peristole is the process by which the food, as it reaches the stomach, is grasped and mixed by the reflex muscular action of the fundus, and the peristalsis consists of the wave from fundus to pylorus driving the food out of the stomach. According to whether one or both of the above-named functions of the stomach are disturbed and also according to the degree of the disturbance, we differentiate:

(a) Hypotony or motor insufficiency of the first degree (***Boas***).
(b) Atony or motor insufficiency of the second degree (***Boas***).
(c) Gastrectasis, due to mechanical obstruction at the pylorus.

(a) HYPOTONY (motor insufficiency of the first degree, ***Boas***). —On account of a disurbance of the peristole the food stays longer in the stomach, thereby burdening the organ and giving rise to weakening of the stomach muscle. According to ***Ehrman***,[1] the disadvantage of a disturbed peristole lies in the fact that the food is not mixed thoroughly enough to be acted upon by the gastric juices.

Etiology.—May be primary, the so-called myasthenia congenita (habitus enteroptoticus, *Stiller*) or acquired or symptomatic atony, as a result of nervous dyspepsia, hypersecretion and organic diseases of the stomach. Hypotony is often associated with enteroptosis, anemia; also often follows prolonged febrile diseases. Hypotony may also be the result of a reflex disturbance from an affection of the intestinal tract like disturbances of the motor function of

[1] Berl. klin. Wochensch., 1911, No. 43.

the duodenum or obstruction of the large intestine. The symptoms consist chiefly of pressure in the epigastrium, belching, varying appetite, constipation and vertigo (*vertigo dyspeptica Trousseau*).[2] Objectively the habitus of the patient is to be considered; the splashing sound is easily elicited, particularly so if the patient has partaken of some fluid. The method described by *Dehio* aids in the diagnosis of hypotony. He gives the patient ¼ to ½ litre of water and finds by percussion the greater curvature below the umbilicus.

In hypotony, the stomach on insufflation does not quite reach to the umbilicus; it does not require much carbonic acid to distend it.

In the atonic stomach, on the other hand, the greater curvature on insufflation is at or below the umbilicus, and the size of the organ is enlarged.

The most important proof of hypotony is the fact that we can demonstrate the food to stay in the stomach longer than normal either by a test meal or by the X-ray.

The prognosis depends upon the underlying cause.

With the habitus enteroptoticus (*Stiller*) the prognosis is less favorable, the symptoms disappear temporarily, to reappear with the slightest fault of diet. In cases, however, where hypotony is an accompaniment of a curable gastro-intestinal disease, the proper treatment will completely cure the condition. The treatment must be individualized, depending upon the underlying cause.

As a general dietetic rule in these cases, the limitation of liquids and the giving of a well-nourishing food in a form most readily expelled from the stomach and best assimilated must be adhered to for some time (sparing the stomach); later food to exercise digestion may be ordered.

Such a diet would consist of cereals well prepared in milk, soft boiled eggs or light puddings, vegetable purée, minced meat, cooked fruit, toasted bread and zwieback. Should there be hyperacidity, plenty of cream and butter should be taken with the food and 2 to 3 tablespoonfuls of olive oil daily before meals. This diet will also overcome constipation. In cases of diminished secretion a light wine after meals is allowed. In these cases orexini tannici, 0.3, 3 t.d.

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[2] Vertigo dyspeptica, Gazette des Hopitaux, 1862.

before meals, serves as an appetizer. Quinine in combination with strychnin is beneficial for the tonic influence.

Extr. nucis vom.		0.03
Nat. bicarb., Pulv. rad. Rhei,	āā	0.4

F. pulv. No. I. Dent. tal. dos.
S. One twice daily after meals (*Oser*).

Einhorn recommends strychnin with arsenic combined.

Solutionis Fowlerii	10.0
Tr. nucis vom.	20.0

S. 20 drops 3 t.d. after meals in water.

Bismuth and strychnin may be combined in cases of fermentation. *Klemperer* recommends for the same purpose creosote 0.03; *Pick* recommends ichthyol 0.1 for the same purpose. Lavage of the stomach is, as a rule, not necessary; sometimes, however, when the outlined treatment is not effective, lavage may be used with advantage a few times only.

Physical treatment, such as massage, gymnastics, electricity, hydrotherapeutics, may be tried.

In cases of marked gastroptosis an abdominal bandage will improve the condition. Some patients improve considerably by change of climate and surroundings.

In protracted cases the *Weir-Mitchell* rest cure, which is best carried out in a sanitarium, is very efficacious.

(b) ATONY or motor insufficiency of the second degree:—By impaired peristalsis of the stomach the food remains in the stomach still longer than when the peristole alone is disturbed, as in hypotony causing a motor insufficiency of the second degree.

In the hypotonic stomach there is no degree of dilatation when the stomach is empty; in the atonic stomach some degree of dilatation exists.

It is also significant of an atonic condition that the stomach should empty itself 2 to 3 hours later than the normal stomach, as demonstrated by the X-ray.

Etiologically, almost the same causes mentioned for hypotony

will finally lead to atony. Of importance in the etiology of atony is an organic stomach disease, either by the pathological process extending to the musculature of the stomach, causing muscular insufficiency, or by the fact that food stays unduly long in a diseased stomach.

For the same reason a long-standing pylorospasm, either due to hyperacidity or erosions or reflexly to cholelithiasis and appendicitis, will give rise to atony. The occurrence of dilatation as a result of atony without existing obstruction at the pylorus has been disputed, but from a clinical standpoint the existence cannot be doubted. Its occurrence is certainly not frequent.

Symptoms.—The appetite is usually markedly diminished, and even if there is an appetite, just as soon as he begins to eat he feels at once full and a sensation of pressure in the stomach, which may persist until the stomach is again empty.

There is also frequent sour eructation of gas and regurgitation of small quantities of food. Frequently there is persistent nausea, seldom vomiting, and at times there may also be slight pain.

Here, too, the vertigo stomachalis *Trousseau* is present. Objectively we find habitus *Stiller*, splashing on palpation, even on an empty stomach, especially so when small quantities of fluid are taken. Insufflation of the stomach will show a slightly enlarged organ.

The *Dehio* test is positive. The test meal stays in the stomach 2 to 3 hours longer.

The chemical test for motility, and especially the X-ray method, will materially aid in the diagnosis.

Prognosis will depend upon the underlying cause. If the condition is of a functional nature and not associated with *Stiller's* habitus, appropriate treatment will cure the condition.

Treatment will depend upon the cause and the secretory conditions.

The dietetic regimé may be of the same nature as that mentioned for the hypotonic condition. The same holds true of the physical therapeutics as well as the medicinal treatment. Lavage of the stomach in these cases deserves special mention, which should be carried out for a longer period than in hypotony, until the tonic condition of the muscle is restored. Care should be taken not to use

more than 250 cc at each washing, and have the lavage water almost fully returned.

(c) GASTRECTASIS DUE TO MECHANICAL OBSTRUCTION OF THE PYLORUS.—*Etiology.*—Stenosis of the pylorus may be congenital, due either to pylorospasm or to hypertrophy of the pylorus.

Acquired stenosis is due either to a pathological condition in the wall of the pyloric part of the stomach or to an obstruction from without. The most common causes from within the stomach are carcinoma, scar formation due to ulcus ventriculi or a localized inflammation of the mucosa causing pyloritis (*Craemer*).

The causes of pyloric obstruction from without are: kinking of the pars pylorica superior due to ptosis of the stomach; kinking of the duodenum by a movable right kidney; perigastritis; organic stenosis of the duodenum by ulcer or carcinoma; cholelithiasis; tumors of the liver or pancreas. Mesenteric glands may also give rise to symptoms of gastrectasis. Furthermore, there may be syphilitic stenosis either as a result of gumma or connective tissue formation.

Early symptoms of the disease are pressure and a sensation of fulness in the epigastrium, pain of a dyspeptic nature, belching of gas and regurgitation, loss of appetite, nausea, headache and vertigo.

Later on, the symptoms become aggravated. The belching is of a foul odor, vomiting, which at first came only soon after meals and gave the patient great relief, now comes, owing to the growing weakness of the muscle of the stomach, in greater intervals and larger quantities, bringing forth food that the patient had eaten days before, while the vomiting now gives but temporary relief. Finally, the vomiting may cease entirely, due to the fact that the stomach muscle cannot expel the gastric contents even by vomiting.

The vomitus usually consists of three layers: the lowest is solid, the middle layer a yellow-brown liquid, and the upper of a foamy nature and brownish color; mucus may also float on top. The odor of the vomitus is often very offensive, due to the decomposition of proteids with formation of H_2S. The result of the chemical examination of the vomitus depends upon the underlying cause of the condition. The microscopical findings show, aside from stagnated

food particles, mucus and epithelia. In benign stenosis sarcinæ are also present.

Gastrectasis leads to marked disturbance in nutrition due to the fact that the patient does not retain and assimilate his food and also to the diminution of fluids supplied to the tissues. The lack of water in the tissues gives rise to marked dryness of the skin, dull expression of the eyes, considerable muscular weakness, excessive thirst, slow pulse and diminution of urine. The latter may contain peptone or albumose.

Boas divides gastrectasis into three degrees, according to the daily quantity of urine excreted:

1st degree: quantity of urine in 24 hours, from 1,500 to 1,000 gm;

2d degree: from 1,000 to 500 gm;

3d degree: less than 500 gm.

Constipation is the rule, but at times there may be fermentative diarrhea.

In the course of time, there are also nervous symptoms.

Occurrence of tetany, which fortunately is not frequent, is prognostically very grave, and is shown by *Chvostek's* facial phenomena, *Trousseau's* obstetric hand phenomena on compressing the arm and *Erb's* electrical phenomena.

Another fatal termination of this disease is the occurrence of coma dyspepticum.

Inspection of the abdomen may reveal visible peristalsis of the stomach, in other cases a characteristic distention of the umbilical or even hypogastric region. On palpation, stiffening of the stomach (Magensteifung, *Boas*) is felt; splashing sound can be elicited even on the most superficial striking of the abdominal wall, extending over to the right side and present on all occasions.

Insufflation of the stomach will require a large quantity of carbonic acid, and it may be possible to percuss the stomach down to the symphysis.

Gastrodiaphony and X-ray examination are not essential to the diagnosis of this condition, as the diagnosis can frequently be made without it.

Examination of the gastric contents shows greatly varying degrees of stagnation. The test breakfast given after having washed out the stagnated food shows disturbed digestion, and the chemical

reaction, depending upon the underlying cause, shows either hyperacidity in benign or anacidity in catarrhal conditions and carcinoma. In the latter disease, the *Boas-Oppler* bacillus and lactic acid are also present. Sarcinæ are present in benign stenosis only. There is always hypersecretion in benign stenosis, as shown by the macroscopical examination of the stomach contents.

When the stomach contents are allowed to stand, the upper liquid portion will be in excess of the other constituents when there is hypersecretion.

Treatment.—This depends upon the causative factor: where the stenosis is due to carcinoma or tumors of the neighboring organs, obstructing the pylorus from without, or when due to adhesions, surgical interference is the only proper procedure.

In cases of benign stenosis, treatment must be carried out according to the stage of the disease and the secretory condition of the stomach.

In that stage of the disease, where macro- and microscopical stagnation is moderate and the size of the stomach is not very large, showing that its musculature is in fairly good condition, mixed diet of semi-solids and liquids between the meals is appropriate.

Following is a diet list for a moderate degree of stagnation with hyperacidity:

Breakfast:	Cocoa with milk	250 gm.
	Sweet cream	30 gm.
	Dry toast	50 gm.
	Sweet butter	20 gm.
	2 soft boiled eggs.	
Dinner:	Scraped beef	150 gm.
	Mashed potatoes	200 gm.
	Sweet cream	30 gm.
	Stewed prunes, apples or pears	150 gm.
	Some farina or tapioca pudding	150 gm.
5 P.M.:	½ milk and ½ sweet cream, warm	250 gm.
	Zwieback	50 gm.
	Sweet butter	20 gm.
Supper:	Cereals in milk	250 gm.
	Scraped unsalted ham	100 gm.
	Sweet cream	50 gm.
	Dry toast	30 gm.

Diet list for moderate gastrectasis with hypo- or anacidity:

Breakfast:	Barley soup	200 gm.
	Dry toast	30 gm.
	Sweet butter	20 gm.
	Water-cocoa	200 gm.
	1 egg	
	Plasmon	10 gm.
	Cream	20 gm.
Dinner:	Finely chopped, broiled meat	150 gm.
	Spinach or carrots	150 gm.
	Mashed potatoes	100 gm.
	Macaroni	100 gm.
	1 wineglassful of light wine	
5 P.M.:	Water-cocoa	200 gm.
	Plasmon	15 gm.
	Sweet cream	20 gm.
	Zwieback	30 gm.
	Sweet butter	20 gm.
Supper:	Barley soup	200 gm.
	Plasmon	15 gm.
	Dry toast	30 gm.
	Butter	20 gm.

Physical Treatment.—Hydrotherapy in the form of Priessnitz compresses at bed-time, or cold rubs in the morning, or the Scottish douche in sthenic cases, or massage and faradic electricity may all aid in the treatment.

The Drugs.—In cases of hyperacidity alkalies, bismuth and magnesia are useful; in cases of pylorospasm belladonna, in suppositories (0.03), twice daily, will be useful; in case of fermentation bismuth salicylate 0.5, 3 t.d. after meals, or resorcin 0.3, or creosote carbonate 10 drops 3 t.d. In hypoacidity or anacidity hydrochloric acid and pepsin; also the amara and strychnin will be useful.

During the early stage lavage of the stomach every morning or every other morning is indicated with warm Karlsbad water or bicarbonate of soda solution in cases of hyperacidity; or with normal saline solution in cases of hypo- or anacidity. The application of lavages may extend from 2 to 4 weeks.

If there is no more stagnation found in the morning, patients

are advised to continue taking an alkaline water, 250 to 300 gm, warm, on an empty stomach in hyperacidity (Karlsbad-Mühlbrunn); or a saline mineral water, the same quantity and also warm on an empty stomach in hypo- or anacidity (Kissingen or Homburg). These waters serve as an autolavage.

Mechanical abdominal support in the form of an elastic binder is useful when this condition is associated with ptosis.

Such patients are benefited when taking a month's treatment every year at a spa or at home.

While the treatment, as outlined above, cannot cure the condition, it will give the patient a comfortable existence for many years to come and prevent the condition from making further headway, provided the patient does not make any serious mistakes in his diet.

It is self-understood that the diet lists outlined above are modified and other articles of food added as the condition improves.

Should the mechanical obstruction increase, most authors agree to have the patient operated upon.

Considering the fact that the results of gastroenterostomy are not uniformly of a lasting nature, and furthermore knowing from experience that patients even in this stage are often considerably benefited by internal treatment, so that the motor function of the stomach is improved to a great extent, we are justified even in these stages of the disease to use our best efforts in overcoming the difficulty by internal treatment. At times, the general condition as well as the dread of the patient of an operative procedure makes it imperative to resort to internal treatment.

In the internal treatment of these conditions we must have two main objects in view.

(1) To have the stomach cleared from stagnated food and mucus, and

(2) To give the food in such a form as to readily pass through the obstructed pylorus and be no burden upon the diseased musculature of the stomach.

To meet the first indication, lavage of the stomach is indispensable. It should be done in the morning, and a very thorough cleansing of the organ is most essential, until the water returns

clear. This can only be accomplished by giving enough time to the lavage, and sometimes it is necessary to do the lavage with the patient in the right or left recumbent position alternately. The lavage has not only a cleansing effect upon the stomach, but it also improves the mechanical power of the stomach.

Lavage also overcomes the pylorospasm that is so often associated with stenosis; and, furthermore, the lumen of the pyloric ring is cleared by the mechanical cleansing of the pars pylorica from accumulated adherent masses of mucus.

The solutions used for lavage in cases of hyperacidity is Karlsbad salt (4.0:250.0); in anacidity normal saline, at a temperature of 105° F. If there is a great deal of mucus in the stomach, cleansing with a silver nitrate solution (1:2000) is beneficial. In cases with marked fermentation boric acid (4.0:250.0) or mild thymol solution (0.5:1000.0) may be used.

To meet the second indication, diet is an important factor.

It is best to start the treatment with rectal feeding for 3 or 4 days, allowing by mouth 700 gm of milk in 1 to 2 tablespoon quantities every hour. The object of this is to give the overloaded stomach a complete rest and to prevent further stagnation.

For the methods of rectal feeding, see p. 75.

After that, when the stomach feeding is commenced, it should be considered that the stenosed pylorus will not allow solid food to pass, and the secretory condition must also be taken into consideration.

For the following week, milk with sweet cream (hyperacidity), soft boiled eggs or, better still, raw eggs, as milk shake, are given. Small quantities of cognac are added in cases of hypoacidity or anacidity.

To add to the nutritive value of the food substances, plasmon and nutrose in tablespoonful doses may be administered.

In this week, the quantity for 24 hours, given in frequent intervals, is milk plus cream from 700 to 1500 cc, also eggs, beginning with 2 and increasing to 5 daily, if well borne.

The artificial food preparations, in teaspoonful doses 2 t.d., are mixed with the milk.

After that time we would advise the following diet list in cases of hyperacidity:

8 A.M.:	150 gm	tea
	50 gm	sweet cream
	20 gm	sugar
	2	soft boiled eggs
	30 gm	toast
	20 gm	sweet butter
10 A.M.:	250 gm	milk soup
	15 gm	plasmon
1 P.M.:	200 gm	scraped beef, minced veal or fish; or
	150 gm	calf's brain or sweetbread
	150 gm	mashed potatoes
	50 gm	sweet cream
	30 gm	zwieback
4 P.M.:	150 gm	tea
	50 gm	cream
	20 gm	sugar
7.30 P.M.:	200 gm	barley soup
	15 gm	plasmon
	100 gm	milk and cream

The patient is supposed to be in bed for the first 3 weeks' treatment; in the following three weeks he should be made to rest at least one hour after each meal and remain in bed after the last meal. To quench the thirst, normal saline per rectum, in quantities of 1 pint two to three times daily, is very beneficial.

In cases of hypo- or anacidity the proteids should be reduced and substituted by carbohydrates. Compots and alcohol in small quantities in the form of light wine may be added.

After that time, while the diet can be increased in quantity, the patient should be strictly cautioned not to make any error in diet.

Forbidden in all stages of gastrectasis are large quantities of liquids or foodstuffs that tend to increase fermentation, spices and highly seasoned food, raw fruit, and sparkling mineral waters.

Medicinal Treatment.—Here strychnin may be placed first for its aid in increasing the motor function of the stomach.

Ext. strych. 0.03
Elacosaccharari menthæ 0.5
Dent. tal. dos. No. X.
S. One 3 t.d. before meals.

In cases of hyperacidity, strychnin is combined with bismuth and magnesia.

Ext. strych.		0.03
Bism. subnitr., Magnes. ustæ,	āā	0.5

Mf. pulv.
Dent. tal. dos. No. X.
S. One 3 t.d. after meals.

In case of spasm belladonna can be added.

The antifermentatives in these conditions are: Bism. salicylicum, menthol, natrium benzoicum and salol.

Obstinate constipation should be overcome as described in the chapter on constipation, p. 196.

Mendel recommends fibrolysin (thiosimin and natrii salicyl.) in antiseptic ampulles, of 2 gr each, to be applied intramuscularly or intravenously, as many as 50 doses, one every day or every second day to aid in the absorption in benign strictures. Its usefulness, however, is very doubtful.

Acute Dilatation of the Stomach

Acute dilatation may sometimes set in suddenly.

It occurs after narcosis, in the course of acute infectious diseases, in extreme overloading of the stomach with unsuitable food; or a shock will sometimes centrally cause paralysis of the stomach muscle.

The symptoms are very acute. They begin with vomiting, extreme restlessness, nausea, retching, quick and weak pulse, and finally coma; death frequently results very quickly.

The treatment consists of active hypodermatic stimulation (camphor, ether, adrenalin, strychnin), above all washing out the stomach and high rectal enemas.

Megalogastria

A naturally large stomach, not at all pathological and known as megalogastria, was described by *Ewald, Rosenbach, Kussmaul* and *Riegel.*

According to *Hodgkin* it is a common occurrence with those who live chiefly on vegetables, which is easily explained when it is considered what large quantities of vegetables must be partaken of to supply the necessary calories, gradually leading to a large stomach.

Gastro-Enteroptosis

By gastroptosis is understood a change in the normal location of the stomach. In most cases it is a sinking of the whole organ: descensus ventriculi, on account of a weakening of the ligament (gastro-hepatica, gastro-duodenal, gastro-renal) and also by traction of adhesions of other organs (colon transversum, etc.).

By enteroptosis is understood the downward displacement of all the rest of the abdominal organs (*Glenhard's* disease).

In gastroptosis the stomach is displaced, but, as a rule, not enlarged, while the emptying of the stomach is usually enhanced.

Kelling[3] differentiates 3 degrees of gastroptosis:

First degree:—Greater curvature at the umbilicus.

Second degree:—Greater curvature under the umbilicus, while the lesser curvature is above the umbilicus.

Third degree:—Both, lesser and greater curvatures, below the umbilicus.

Etiology.—May be congenital or acquired.

The congenital form of gastroptosis occurs in individuals with "*Stiller's* habitus."[4] This habitus is associated with a general asthenic condition, with the following characteristics:

Long, narrow thorax, with a pointed epigastric angle, anemic appearance, in some cases movability of the tenth rib and general hypoplasia of the blood-vessels.

The acquired form of gastroptosis occurs most commonly in women who have been through repeated pregnancies; also in people who have lost considerable weight. It is often associated with movable kidney, particularly the right.

The corset is undoubtedly a great etiologic factor in causing gastroptosis.

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[3] Volkmannsche Sammlung, 1896, No. 144.

[4] Archiv. f. Verdauungskrankh., 1896, Vol. II, and 1901, Vol. XLI. Berl. klin. Wochensch., 1899, No. 34.

Symptoms.—Various degrees of dyspeptic disturbances, like capricious appetite, pyrosis, belching, fulness, constipation, enteritis membranacea, pulsation in the epigastrium, backache, reflex nervous disturbances (palpitatio cordis, headaches, hypochondria, disturbed sleep) may be the result of gastroptosis.

These symptoms are, according to *Meinert*, brought about by dragging on the abdominal sympathetic plexus.

Objectively, the greater curvature of the stomach can be seen in thin patients, especially by artificial distention with carbonic acid. We can palpate in these cases the descended transverse colon and the kidneys, particularly the right.

The secretory condition is not disturbed, if there is no other gastric disease; the motility, on the other hand, is usually lowered —hypotonic.

Splashing sound is elicited.

Prophylaxis.—Corsets, if worn at all, should be without steel ribs, with shoulder straps, and held tight by front buttons.

Women, during and after pregnancy, should be fitted with proper abdominal binders.

The treatment of the disease proper must depend upon the etiology, the general state of nutrition and the symptoms.

In most of these cases a rest cure is very beneficial.

Von Noorden[5] proved with the X-ray that gastroptosis was markedly improved after a rest cure.

The diet should be very nourishing, consisting mainly of carbohydrates, milk, cream and butter. Constipation is to be overcome chiefly through the diet, in the spastic forms by the oil-enema treatment (see p. 72).

Associated with gastro-intestinal catarrhal conditions, the spas may be recommended.

For the anemic and nervous condition, iron, arsenic (subcutaneously), phosphorus and the bromides may be necessary.

The mechanical treatment consists of a proper abdominal support, either as elastic binders or, as *A. Rose* advised, by application of adhesive plaster belts.

For the general condition, mild forms of hydrotherapeutics, electrical applications as well as massage have a beneficial influence.

[5] Therapie d. Gegenw., Jan., 1910.

Finally, the surgical treatment must be mentioned:

In very rebellious cases, and especially in those with marked nephroptosis giving rise to the symptoms known as *Ditel's* crisis, nephropexy may be advised, although the result is not permanent in the majority of cases.

For gastroptosis, gastropexy has been advised, but so far all the operated cases have given unfavorable results.

The Cecum mobile described by *Wilms* [6] is a form of enteroptosis where the cecum is displaced, giving rise to symptoms very similar to those of chronic appendicitis. The symptoms, as described by *Wilms*, are subjectively painful sensation in the right iliac region with a sensation of fulness; mostly constipation and reflex gastric disturbances, like distention, epigastric distress, loss of appetite and eructations. Objectively there is tenderness in the right iliac region, but no rigidity. On deep palpation the mobility of the cecum can be distinctly made out.

Kuttner has lately pointed out a differential sign between chronic appendicitis and other diseases located in the right iliac region. He insufflates the colon with air and finds that in all cases of chronic appendicitis, the insufflation of air causes pain in the appendicular region, not so when the right iliac region is the seat of another disease. Operative treatment, according to various authors, in the form of cecoplexy, is claimed to relieve the condition. Of late, however, *Fischler* [7] considers this condition to be a "Typhlatony," which should be treated internally, and *Stieler* [8] speaks of the same condition, calling it constipation of the "ascending type" and recommends internal treatment.

We are also of the opinion that internal treatment should be conscientiously carried out to relieve the affection by diet, high enemas and general hygiene, before an operative procedure is advised.

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[6] Deutsche med. Wochensch., 1909, No. 41.
[7] Münch. med. Wochensch., 1911, No. 23.
[8] Münch. med. Wochensch., 1911, No. 36.

CHAPTER V

Nervous Affections of the Stomach

By gastric neuroses are understood digestive disturbances without any demonstrable pathological lesions of the stomach. It is, therefore, a purely functional disease, in contradistinction to organic affections of the stomach.

In the majority of cases the gastric symptoms are associated with general nervous manifestations. At times, however, the gastric symptoms are the only symptoms of a nervous affection.

Gastric neurosis may manifest itself as secretory, motor and sensitive disturbances, or a complication of the same (nervous dyspepsia). In order to diagnose a disease of the stomach as purely nervous, a thorough general examination must be made and, above all, a positive exclusion of a pathologic change in the stomach must be established. The subjective symptoms are never a sufficiently characteristic guide in the diagnosis and we must chiefly rely upon the frequent observation of the changeability of the subjective symptoms. It is not surprising to find that the subjective symptoms would depend upon the psychic state.

The findings of the gastric contents also vary, changing from hyper- to anacidity.

The etiology of gastric neurosis may be constitutional as in *Stiller's* habitus, or due to neurasthenic inheritance, to excessive mental or even physical work and also to sudden shocks. Gastric neurosis is also frequently a reflex manifestation of pelvic disorders, sexual diseases of both sexes, chronic constipation.

Frequent etiological factors are the organic diseases of the nervous system, especially tabes dorsalis.

a. Secretory Gastric Neurosis

Hyperacidity (*Hyperchlorhydria*).—By this is understood a secretion of gastric juice obviously normal in quantity, but of a higher concentration.

According to *Riegel* there is hyperacidity when the free acidity amounts to 50 or 60 after a test breakfast, or 60 to 80 after a test meal. The macroscopic appearance of the stomach contents shows the solids finely distributed, the starch food forming a sediment.

The iodin test on the starch shows poor conversion of starch into dextrose. In some cases there may be symptoms of hyperacidity with normal acidity, due to hyperesthesia of the gastric nerves. This is termed by *Strauss* and *Schüler* [1] hyperaciditas larvata.

Symptoms.—Patients usually complain of pyrosis, belching, and pressure in the epigastric region, sometimes of real pain 2 or 3 hours after a meal, which is relieved on taking milk or alkalies. Appetite is usually good, the state of nutrition is well preserved, unless the patient is of a congenitally asthenic type, or, as is so often the case, the patient is afraid to eat.

A diagnosis is almost impossible upon the symptoms alone. We must chiefly rely on examination of the gastric contents. In pure hyperacidity there is usually an empty stomach on fasting condition; the test breakfast will show an increase in acidity; chymification is good, the conversion of starch into sugar is incomplete, as shown by the iodin test.

The motility of the stomach is increased, which is also an important diagnostic point in functional hyperacidity.

Differential Diagnosis between Hyperacidity and Gastritis Acida.—In the latter, motor function is slightly disturbed as a rule; mucus in the gastric contents is always present; the changes in acidity persist; psychic emotions have but little influence on the course of the disease.

Between hyperacidity and ulcer of the stomach the differential diagnosis may, in some cases, be very difficult. What guides us is persistent hypersecretion in ulcer, disturbed motility on account of pylorospasm and hypersecretion. The greatest aid is the presence of occult blood in the feces.

Hypersecretion (*Gastrosuccorrhea*).—In cases of persistent hyperacidity, hypersecretion sets in. The secretory nerves are irritated on account of hyperacidity, directly bringing about excessive secretion, or, according to *Pawlow*, the hyperacid contents in the duo-

[1] Deutsche med. Wochensch., 1900, No. 19.

denum cause reflex pylorospasm, keeping the food in the stomach until the pancreatic juice is secreted that neutralizes the contents. *Riegel* called this form of hypersecretion "alimentary hypersecretion."

The extracted stomach contents are greater in amount than the quantity ingested and, when allowed to stand, a very minute solid sediment will be formed.

Another form of hypersecretion is one where excessive secretion is the result of irritation of the gastric glands. This secretion disappears when the stomach is empty. *Boas* calls this form "digestive gastrosuccorrhea."

Yet another form of hypersecretion is continuous hypersecretion (*Reichman*).[2] In this disease there is acid hypersecretion on an empty stomach. *Riegel* differentiated this hypersecretion from that associated with gastrectasis by the fact that in the former the difference between the free and the combined acid is a small one.

Another form is intermittent hypersecretion (gastroxynsis, *Rossbach*). It occurs periodically with severe headaches, gastric pains and vomiting of sour food on an empty stomach.

This secretory neurosis is closely allied to migraine. *Soupault* considers it an early symptom of tabes dorsalis.

From an anatomico-pathological standpoint there are no changes in all the forms of hypersecretion.

Symptoms.—These are of a type resembling those of hyperacidity, but more exaggerated. The pyrosis may assume the character of real pain, even on an empty stomach and, like ulcer of the stomach, is relieved by alkalies or food. Frequently there is sour vomiting without food. The urine shows a diminution in chlorids and an increase in phosphates.

Treatment.—We must first treat the underlying cause according to whether it is of an organic or neurotic character.

If together with hyperacidity there exists habitus *Stiller*, a *Weir-Mitchell* rest cure would achieve the best results. If, on the other hand, we are dealing with well nourished individuals, we should not, as in organic diseases, adhere to a strict diet for a great length of time.

We should differentiate in all these cases between two dietetic

[2] Berl. klin. Woch., 1882, No. 40, and 1884, No. 2.

periods. The "sparing diet" which means to give a food not irritable to the stomach and will also most readily leave the stomach. Then an "exercise diet" is instituted, in which a more liberal diet list should be adopted.

During the sparing period a mixed diet is given, lacto-vegetable substances predominating, also fair quantities of fats of low melting point.

The vegetables—spinach, carrots, string beans, potatoes—are to be given in purée form; the meats, as white meats, sweetbread, calf's brain, ought to be given in finely minced or chopped form. Bread is to be given in the form of toast or zwieback. The carbohydrates are best borne in combination with albumen and fats.

Compots are not to be allowed during this stage. During the exercise stage we may allow meat broiled and also red. Bread may be allowed, as rye bread without caraway seeds, or white bread, not toasted, one day old.

Compots may here be freely given.

The beverages allowed are weak tea, plain water or alkaline waters.

Of late, investigations have shown that sugar in hyperacidity is to be recommended in these cases, owing to its tendency to decrease acidity. The sugar may be given with the meals; as milk-sugar, when constipation exists, in doses of 1 to 2 tablespoonfuls two to three times daily, also as fresh honey with the breakfast.

As to drugs, the alkalies alone or in combination with belladonna or atropin are very useful. *Ehrmann* and *Rosenheim* recommend neutralon. Perhydrol (hydrogen peroxide, 25% in tablets) is also recommended. For marked nervous symptoms the bromides and valerian preparations are indicated. For nervous hyperacidity the spas are, as a rule, contraindicated.

Change of climate and surroundings, either at the sea or mountainous regions, is very beneficial.

In marked hypersecretion lavage with alkaline water may be necessary. Sometimes the best result will be obtained with a regular ulcus treatment (*Lenhartz*).

Forbidden in these conditions are all spices, condiments, liquor, strong coffee, beef-juices. Smoking is to be restricted.

Hypoacidity (*Subacidity*) *and Anacidity.*—Purely nervous

forms of subacidity are extremely rare. Subacidity is usually the expression of a catarrhal condition of the gastric mucosa.

To diagnose a nervous sub- or anacidity, it must be shown by the findings of the gastric contents that there are changes in the degree of acidity. There is no mucus found at any time. Nervous phenomena are usually associated with this condition.

Therapy.—A diet poor in proteids and rich in carbohydrates and vegetables is appropriate. Mild condiments, such as salt and spices, are allowed, also small quantities of cognac and white wine. Saline waters (Kissingen, Homburg) to be taken warm (about 250 to 300 gr.) on an empty stomach. Mild hydrotherapeutic measures are beneficial. In anemic condition, change of climate will be useful.

Medicinal treatment consists of general tonics like arsenic and iron; the amara, like nux vomica, condurango or orexin, as appetizer, are often useful.

Hydrochloric acid and pepsin with the meals are often indicated.

Where intestinal fermentation is a pronounced symptom of the disease, pancreon 0.5, 3 t.d., is indicated.

b. Motor Neurosis of the Stomach

Nervous eructation is often associated with pyrosis and is due to the swallowing of air (aerophagia).

The eructation may be accompanied by a barklike noise. In severe cases, cardiac sensations of an unpleasant nature, like palpitation of the heart and precordial anxiety, are liable to coexist.

Pneumatosis of the stomach is mostly the result of aerophagia, the excess of swallowed air causing distention of the stomach and a spastic contraction of the cardia and pylorus. It gives the stomach an inflated, cushionlike appearance. The symptoms associated with this condition are arrhythmia, cardiac palpitation, nervous anxiety and dyspepsia (asthma dyspepticum).

From a therapeutic standpoint, the patient is ordered to suppress the habit of air-swallowing.

Penzoldt advises breathing with the mouth open, which would render air-swallowing difficult. Others recommend placing a cork between patient's teeth from time to time in order to make him

breathe with his mouth open. The stomach tube is sometimes necessary to remove the gas and overcome the cardiospasm.

In a case cited by *Schlesinger* a gastrostomy had to be done and a tube introduced through the fistula in order to evacuate the gas.

As to drugs, belladonna, valerian (valedol, because of the menthol it contains), cocain, menthol and the bromides are beneficial.

Physical and hygienic treatment directed against the nervous symptoms is most important.

In regurgitation of sour food, if purely nervous, the underlying cause is to be removed.

Rumination (*merycism*) is brought about by an antiperistaltic movement of the esophagus and stomach. In a few cases that came to autopsy, an ante-stomach has been observed. The condition is more frequent in men than in women. It is seen in mental diseases, but is also found as an inherited condition. Some have acquired the habit by seeing others practicing it (imitation). While it is usually a neurosis without any change in the secretory condition of the stomach, the latter should be determined in order to correct it, if necessary.

The treatment should be suggestive; even hypnotism may be necessary; likewise the bromides and other nerve sedatives.

Nervous Vomiting.—In order to make a diagnosis of purely nervous vomiting, organic disease of the stomach must be excluded, also diseases of the intestines, peritoneum, sexual organs, gall-bladder, kidneys, nasopharynx, central nervous system and toxemic vomiting (of pregnancy). The vomiting of hysterics of individuals suffering from migraine or seasickness, are to be regarded as nervous vomiting.

Ad. Schmidt [3] speaks of periodic vomiting as analogous to migraine and sometimes replacing the migraine. He found it associated with gastroptosis, and favorably influenced the condition by lavage of the stomach.

Therapy is first to be directed to overcome the general neurotic condition. During the attack, small doses of cocain, anesthesin, orthoform, valedol, swallowing of ice, orexin, tincture of iodine

[3] Mediz. Klinik., 1911. No. 50.

(gtt ii–iii) every 3 hours, is beneficial. At times the condition is so persistent that rectal feeding and lavage of the stomach are to be resorted to. Counter-irritation, in the shape of sinapisms or Priessnitz compresses with an ice-coil between the two layers in the region of the epigastrium, is often useful.

Purely neurotic, *peristaltic unrest* (termed "termina ventriculi" by *Kussmaul*) sometimes occurs where there are visible and audible movements of the stomach; they are so severe that they sometimes disturb the patient's rest at night.

Functional hypermotility of the stomach, causing the food to leave the stomach too quickly and giving rise to bulimia, has been observed in hysteric individuals.

It is advisable in such cases to give small meals at frequent intervals in purée form.

c. Neurotic Disturbances of the Sensibility of the Stomach

HYPERESTHESIA OF THE GASTRIC MUCOSA

This condition is characterized by a mildly painful reaction of the gastric mucosa on partaking of food—even water.

There is also a sensation of a painfulness in the region of the stomach. Examination of the gastric contents shows nothing abnormal.

Therapeutically, silver nitrate is very efficient.

Silver nitrate	0.25
Aquæ	150.0

S. One tablespoonful 3 t.d. in a wineglassful of water before meals.

Furthermore, belladonna, anesthesin, chloroform.

Chloroformi	1.0
Bism. subnitr.	3.0
Aquæ	150.0

S. One tablespoonful every 3 to 6 hours in water.

CARDIALGIA OR GASTRALGIA

(1) Purely functional; chlorosis, hysteria, neurasthenia, general asthenic conditions like post-febrile gastralgia.

(2) Reflex gastralgia, due to a disease of the central nervous system, tabes dorsalis, transverse myelitis and disseminated sclerosis.

(3) Gastralgia as a result of malaria, nicotin poisoning and gout.

(4) Gastralgia as a result of arteriosclerosis, especially of the coronary arteries and abdominal aorta; also as a result of cardiac disturbances like aortic regurgitation and mitral stenosis.

This condition is characterized by intense paroxysms of pain in the epigastrium, accompanied by prostration and collapse, but entirely independent of meals. The duration of the attacks varies from a few minutes to a few hours. The frequency varies by weeks; or there may be painless intervals for years. Local pressure relieves the pain. Vomiting is extremely rare.

Treatment depends upon the underlying cause. In the neurotic type, general systemic treatment in the form of hydrotherapeutic measures, electricity and massage are to be recommended. During the attack, either hot or cold compresses, valerian preparations, bromides, belladonna, are beneficial.

In rare cases narcotica must be resorted to, such as codein, 0.01–0.02, or pantopon, 0.02.

In gastralgia due to chlorosis, liquor ferri sesquichloridi (6:180) in tablespoonful doses, 3 times daily, is beneficial.

In the second type, if due to tabes, antipyrin, 0.5, combined with cereum oxalate, 0.1, a few times daily, may give relief. *Roemer* recommends adrenalin (1:1000) 6 drops, 3 t.d.

Of late, the *Foerster* operation has been recommended for the treatment of tabes dorsalis.

In arteriosclerotic gastralgia, diuretin, 0.7–1.0, 3 t.d., sod. iodati, 0.5, 3 t.d., is useful.

d. Nervous Dyspepsia

The conception of the true meaning of nervous dyspepsia is still under dispute. *Ewald* and *Boas* consider nervous dyspepsia a

mixed neurosis, i.e., general neurasthenia, with gastric symptoms predominating.

The anatomical changes of the gastric mucosa are negative, and the same is true of the secretory changes. It is also characteristic that such patients show hyperexcitability, headache, sleeplessness and vasomotor disturbances.

Etiologically, the same causes that play an important part in general neurasthenia are responsible, such as mental and physical overwork, sudden shock, prolonged worriment, sexual excesses and perversion; sometimes reflexly as a result of pelvic diseases in women or of genito-urinary diseases in men. The gastric symptoms are chiefly pressure and fulness in the stomach, especially connected with the ingestion of food; appetite is disturbed; the patient is afraid to eat and is liable to become emaciated to a considerable extent. There is often persistent constipation of the spastic type.

The general appearance of the patient is either depressed, or there is an abnormal state of excitability.

Another characteristic sign of the affection is the changeability of the symptoms and the fact that patients are sometimes entirely free from symptoms.

Psychical emotions and climacteric changes have an influence on the symptoms.

Prophylaxis.—Individuals with a nervous inheritance or nervous disposition (habitus asthenicus) should from childhood be systematically trained and bodily hardened; they should be kept away from every excess, and every effort should be made to strengthen their nervous system.

Treatment of the condition consists in treating the underlying neurasthenia by change of climate, hydrotherapeutic measures—their mode of application to be individualized—open-air baths, exercise, massage and electricity. Of great importance is psychic treatment. In many such cases the only rational way is to resort to treatment in a sanitarium. As many of these patients are considerably undernourished, and as the proper kind of overfeeding is the only solution of the problem, the *Weir-Mitchell* rest cure, modified in the following way, is very beneficial:

The general principle of the treatment consists in gradually in-

creasing the daily quantity of food of a mixed form, with milk predominating, progressing until the patient is sufficiently overfed to put on weight. The treatment lasts from 4 to 6 weeks, during which time the patient must stay in bed, with a proper person in attendance who must exercise a favorable psychic influence upon the patient.

Massage, resistant movements, electricity, hydrotherapy, replace the active physical exercise of the patient.

We start with 100 gm of milk and zwieback every 2 hours and gradually increase the quantity until after 14 days 2 to 3 quarts of milk are taken daily; if there is repugnance to milk, tea, coffee, or cocoa, lime-water, sugar or salt may be added to the milk. As early as three days after commencing the treatment, a mixed diet in purée form is added to the chief meals—at noon and 6 P.M.

7.30 A.M.: 2 pts milk and 2 zwiebacks
10.00 A.M.: 2 pts milk and 1 zwieback
12.30 P.M.: 1 plate of soup with an egg, 50 gm roast meat, mashed potatoes
3.50 P.M.: 2 pts milk and 1 zwieback
5.30 P.M.: 2 pts milk and 2 zwiebacks
8.00 P.M.: 2 pts milk, 50 gm roast meat, white bread and butter

On the ninth day the diet should have increased to the following:

7.30 A.M.: 2 pts milk and 2 zwiebacks
8.30 A.M.: Coffee and cream, white bread and butter
10.00 A.M.: 2 pts milk and 2 zwiebacks
12.00 noon: 2 pts milk
1.00 P.M.: Soup with an egg, 100 gm meat, mashed potatoes, 75 gm stewed prunes
3.30 P.M.: 2 pts milk
5.30 P.M.: 2 pts milk and 2 zwiebacks
8.00 P.M.: 2 pts milk, 60 gm meat, white bread and butter
9.30 P.M.: 2 pts milk and 2 zwiebacks

Burkart arrived on the fifteenth day at the following respectable diet in grave dyspepsia of hysteric origin:

7.00 A.M.: 500 gm milk
8.00 A.M.: Small cup of coffee or tea with cream.
80 gm cold meat
1 milk cake
20 gm butter
100 gm roast potatoes

10.00 A.M.:	300 gm milk
12.00 noon:	300 gm milk
1.00 P.M.:	200 gm soup
	200 gm roast
	200 gm mashed potatoes
	125 gm prunes
	200 gm farinaceous dessert
3.30 P.M.:	500 gm milk
5.30 P.M.:	300 gm milk
	80 gm cold roast
	1 milk cake
	20 gm butter
8.00 P.M.:	80 gm roast meat
	40 gm zwieback
	500 gm milk
9.30 P.M.:	500 gm milk
	20 gm zwieback
Total calories:	4600.

During the entire time the digestive apparatus must be thoroughly watched, so that we can add to, or abstract from, the diet according to indications.

Massage of the entire body is to be done twice daily for 10 minutes to 1 hour.

Electricity should be in the form of the faradic current, applied to the various motor areas of the body for 10 minutes to 1 hour every day. After the sixth week patient may leave the bed, and after the seventh to ninth week he may return to normal diet.

Where the rest cure, as above described, need not or cannot be carried out, hygienic, physical and dietetic treatment should be instituted to overcome the symptoms. From a dietetic standpoint we must give the "sparing diet" for the first 3 or 4 weeks, which corresponds to the diet of the third or fourth week of *v. Leube's* ulcer treatment (see p. 208).

As to drugs, we may be able to get along without them. If necessary, the nerve tonics: iron, arsenic, quinine, strychnin and phosphorus should be tried. Nerve sedatives to be used are bromides, valerian; orexin and the amara may be necessary.

For constipation, which is usually spastic in type, the oil treatment (see p. 72) is beneficial.

CHAPTER VI

Diagnosis and Therapy of the Intestines

General Diagnostic Part

Anamnesis.—As in gastric affections, the history is a most important part to aid in diagnosis, and its establishment should always precede the physical examination.

The questions should not be leading, and the patient should be allowed to explain his symptoms in his own way. We should then elicit a careful specification of the most important symptoms.

If, for example, the patient complains of abdominal pain, the question is whether they are local or diffused, whether they occur suddenly or gradually, and whether they are dependent on intestinal evacuation; also whether the pain is relieved on pressure, whether there is hypersensitiveness of the skin and, above all, where the pain is located; whether rest influences the pain, whether nausea and vomiting accompanies it, also whether prostration and collapse are associated symptoms. Furthermore, the radiation of the pain must be determined. We should inquire whether there is any rectal tenesmus. The character of the stool must be inquired into, whether there is diarrhea or constipation. The stool should be examined by the methods to be described later.

A. PHYSICAL EXAMINATION

Inspection.—In inspecting the abdomen, we first notice the form, distention; we look for visible peristalsis and observe whether the surface is even or shows localized protrusions. We also look for striæ, veins and herniæ in the umbilical region and in the linea alba.

Palpation.—Of greater importance than inspection is palpation. The patient is to lie flat on his back, or with legs slightly flexed, on an uncushioned table about 3½ feet high, the examiner standing

or sitting on the right side of the patient. Patient should keep his mouth open and be asked to perfectly relax himself. In order to facilitate relaxation, it is necessary to distract patient's attention by talking to him. Sometimes successful palpation can be carried out in a warm bath.

Talcum powder or vaseline, applied to the abdomen, facilitates palpation in some cases.

Our first attention should be directed to pressure sensations and pain; then follows succussion and its localization. A distinct succussion sound would point to atony of the intestines.

Boas injects 200 to 300 cc of lukewarm water into the rectum to test for succussion; if present, he speaks of atony, whereas normally 500 to 600 cc are required to cause succussion.

The location of palpating tumors is mostly judged by the degree of mobility of the tumor. The best movable tumors are those of the small intestine. Tumors of the transverse colon and the flexuræ are likewise movable, owing to their own mesentery.

The least movable are those of the cecum, ascending and descending colon.

In palpating a tumor, its size, consistence and sensitiveness should be taken into consideration.

Carcinoma, sarcoma and plastic tuberculosis are sensitive to pressure, but not painful, while inflammatory tumors are painful. Malignant tumors are hard and nodular. On respiration, tumors of the flexura and transverse colon are movable.

Pseudo-tumors, like coprostasis, are mostly localized in the descending colon, rarely in the splenic flexure, and will give the impression of real tumors.

Before deciding upon the diagnosis of a tumor of the intestines, a thorough evacuation of the bowels by a soapsud enema or oil enema is necessary.

After having carried out the superficial palpation, "deep palpation" is proceeded with, starting at a point distant from the seat of pain.

In order to palpate a particular portion of the intestines, the hand is kept on the abdomen in that particular region, letting the patient breathe with his mouth open and taking advantage of expiration to gradually dig deeper, until we reach the posterior wall.

Now the examining hand glides vertically to the part of the intestine to be examined, by which procedure we succeed in localizing the different portions of the colon. The parts most easily accessible are the cecum, the ascending and descending colon.

The cecum is usually found in the right inguinal fossa and, if movable, can also be palpated higher up in the right hypochondrium. The ascending colon usually contains liquid and gas, and gives a cushionlike feeling to the fingers. The descending colon is mostly empty; sometimes scybala may be felt there. It may feel cordlike in cases of spasticity of the descending colon.

The sigmoid is painful in sigmoiditis.

The colon transversum is not readily palpable, but by the method above described we will succeed in a number of cases.

The palpation of the appendix is to be carried out with the "double-hand" palpation, beginning superficially at McBurney's point and gradually digging into the psoas.

In normal conditions, the appendix is very rarely palpable.

It should be remembered that the localization of the appendix is not uniform. It may lie over the psoas in the pelvis or higher up at the external surface of the cecum, or behind the latter.

Percussion is of less diagnostic aid than palpation. Light percussion (*Goldscheider*) is of more diagnostic aid. Normally, the various parts of the abdomen have different degrees of tympany, the left side of the abdomen over the flexure being of a higher pitch. This was utilized by *Traube* for purposes of diagnosis. If there is a reduced tympanitic tone over the sigmoid flexure, after the bowels have been emptied, it points to disturbance in the tone of the muscle wall of the sigmoid (sigmoiditis, *Traube's* phenomenon).

Auscultation is of almost no diagnostic value in abdominal diseases.

In peritonitis, the *Beatty-Bright* friction sound may be heard.

Insufflation of the intestine may sometimes aid in localizing stenosis of a high degree; also tumors, as to whether they belong to the intestines; and the congenitally dilated colon (*Hirschsprung's* disease).

Boas utilizes irrigation of the intestines for diagnostic purposes. A few hours after a natural defecation he washes out the

intestines with normal saline and examines the return water micro- and macroscopically.

The importance of the X-ray examination is discussed in a special chapter.

Of inestimable aid in local intestinal diagnosis is the speculum and the rectosigmoidoscope. The speculum serves the purpose of inspecting the anus and rectum up to 8 to 10 cc. For higher inspection, Strauss' rectosigmoidoscope is used (see Fig. 9, p. 186).

Before introducing the instrument, the bowels should be thoroughly emptied. In order to overcome the pain at the external sphincter, the application of 10 to 20% anesthesin salve, 2 to 3 minutes before the use of the instrument, is necessary.

Inspection through the instrument supplies information about fissures, erosions, ulcerations, hemorrhoids, fistulas, malignant disease, and also about functional spastic and the general condition of the mucous membrane. An instrumental examination ought to be preceded by an inspection of the anus and digital examination of the rectum. We note any discharge from the rectum, fissures, external hemorrhoids, fistulas. With the fingers we feel first the condition of the sphincter, internal hemorrhoids, prostate, its size and consistency. We also feel obstructions higher up, if any, impacted feces and low rectal carcinoma. For detailed description of Rectoscopy, see p. 187.

B. EXAMINATION OF FECES [1]

Functional Tests of the Intestines

The function of the gastro-intestinal tract can best be studied by the character of the feces, an examination of which is therefore unavoidable. The feces are to be examined first after the ordinary diet and, secondly, after a test meal, as advised by *Ad. Schmidt*.

In normal individuals 1 to 2 movements daily are the rule; exceptions are vegetarians who may move oftener than twice daily, and

[1] ***Klopstock*** and ***Kowarsky:*** Chemistry, Microscopy and Bacteriology. Rebman Company, New York.

others where absorption and assimilation is so complete that very little residue is left and a movement occurs every second day.

The form of the stools is cylindrical and the consistency pulpy. If they have the consistency and form of sheep's feces (scybala), it indicates that there is obstinate constipation, either anatomical or functional. Ribbonlike stools point to spastic constipation or stenosis; a stool deposited in the form of one large, massy cylinder, dry in consistency, indicates atonic constipation. The odor is normally due to scatol. A more offensive odor is due to excessive decomposition of proteids. It is still more offensive in enteritis and in tumors breaking down (cancer of the large intestine).

A sour-smelling stool points to disturbed carbohydrate digestion.

The color of the stool is dark brown. In excessive lacto-vegetable diet it is of a lighter shade. Green color depends upon the chlorophyl of certain vegetables or on bilirubin in cases of increased peristalsis, so that there is no chance for the bilirubin to be converted into hydrobilirubin. This is the reason why calomel produces green stools. Bismuth and iron give black stools; rhubarb, senna and santonin give light yellow stools; cocoa, brown.

Acholic stools are due to the presence of excessive fat, either because fat is ingested in excessive quantities or there is a disturbance in the function of the liver or pancreas which would prevent the splitting of the fat and proper absorption.

Acholic stools show acid reaction, on account of the fatty acid.

Excessive blood in the stools colors them chocolate brown, or even black.

Minute quantities of blood can only be detected spectroscopically or chemically.

Minute admixture of blood to the stools is known as occult blood. The methods of detecting occult blood are the following:

The Guaiac Test.—Five to 10 cc of feces are rubbed up with about 5 cc of concentrated acetic acid, after which 5 cc of ether are added. The test-tube is slowly turned up and down to mix the contents. We now let the tube stand until the ether comes to the surface. A second test-tube is used to dissolve resin of guaiac in absolute alcohol to form a light brown solution. To 1 cc of the floating ether and 1 cc of the guaiac solution are added a few drops of H_2O_2. If occult blood is present, we will get a blue color.

According to *Boas*,[2] a more reliable test is the guaiac test with the following modification: After a strict 3 days' meat-and-fish-free diet the feces are rubbed up with an acetic-acid-alcohol solution (acidi acetici glacial., 25; alcohol absol., 75), then filtered; then 10 to 15 drops of fresh resin guaiac alcohol solution are added without shaking, and 15 to 20 drops of a 3% H_2O_2 solution. If occult blood is present, a dark blue or strongly violet color is obtained.

Aloin Test.—The procedure with feces up to the addition of ether is exactly the same as described for the guaiac test. At this juncture we dissolve aloin in absolute alcohol, 1 cc of which, plus the floating ether, is treated with H_2O_2 or a few drops of old French turpentine, and we get a rose or cherry-red color.

Benzidin Test.—In this, the most sensitive test of all, benzidin is dissolved in glacial acetic acid. The feces are treated with concentrated acetic acid, plus ether, as in the other test. Now a few drops of H_2O_2 are added to 1 cc of the benzidin solution, and a blue color will result.

Phenolphthalein Test (*Boas*).—One gm of phenolphthalein and 25 gm of potassium hydrate are dissolved in 100 gm of water, to which 10 gm of zinc powder is added, boiled over a small flame, and shaken until the original red color disappears. Filter when hot and add a little more zinc powder.

The test: Feces rubbed up with glacial acetic acid, ether added and mixed. After the ether comes to the surface, pour off the ether extract and treat it with the reagent, gtt x, shake, and add 4 drops of H_2O_2, and there will be a rose or intensely red color.

It is requisite that the patient be put on a meat-free diet for 2 to 3 days, or at least have all red meats and meat juices excluded from his diet. Prunes may also give a positive benzidin reaction and should therefore be excluded.

All other sources of bleeding must be excluded.

Another abnormal constituent of the stool is pus, which is seen macroscopically when present in considerable quantities; if only minute quantities are mixed up with the feces, the pus can only be detected microscopically.

Mucus in the stool indicates an inflammatory condition of the

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[2] Berliner Klinische Wochenschrift, No. 4, 1913.

mucous membrane of the intestines. Except when the feces are very hard, small shreds of mucus may be seen on top of the scybala without any inflammatory condition of the intestines, and in colica mucosa large shreds are thrown off at intervals and there is no inflammation of the mucous membrane of the intestine. This condition is probably due to functional hypersecretion. Larger pieces of mucus originate in the large intestine; if the stool is thin and the mucus therein of minute size, we attribute the disturbance to the small intestine. In order to confirm that the condition has originated in the small intestine, the microscopical examination should show broken-up cells embedded in the mucus, free nuclei and particles of undigested food.

The *bichloride test* for bilirubin in the stools aids in the diagnosis, showing, as it does, that the bilirubin has not been converted into hydrobilirubin. The test is as follows:

Part of the feces is thoroughly rubbed up and shaken in a concentrated solution of sublimate and kept for 24 hours. If bilirubin is present, there will be a green color instead of the normal red.

Of very important diagnostic significance is the macro- and microscopical presence of undigested food substances.

Connective tissue shows disturbance of gastric digestion; muscle fibre points to disturbance of the pancreatic digestion; numerous starch granules show disturbance of the small intestine or pancreas.

Microorganisms.—Normally, yeast fungi are found in small numbers; in diarrhea they appear in larger numbers, together with sarcinæ.

The different groups of bacterium coli, the bacillus subtilis, the bacillus putrificans, bacterium lactis aerogenum, and rarely the bacillus pyoceaneus *Escherich*, are present.

Crystals are normal and pathological constituents of the stools. They are found as triple phosphates, calcium phosphates as calcium oxalate; fatty acid crystals in the form of needles; very rarely cholesterin in the form of rhomboid crystals, and sometimes *Charcot-Leyden* crystals.

As to *ferments*, it is important to look for trypsin in the stools, which is present in small quantities in the normal and in larger quantities in the pathologic stool.

The *O. Gross*[3] method of determining the trypsin of the stools rests on the property of trypsin to digest casein, and is determined in the same way as obtains in pepsin determination for proteids. (See p. 12.)

The functional test of the intestines is simplified by the *Ad. Schmidt* test meal:

Breakfast: ½ litre milk, or tea, coffee or cocoa with plenty of milk;
50 gm zwieback;
½ litre barley soup (40 gm barley, 10 gm butter, 200 gm milk, 300 gm water);
1 soft boiled egg.

Dinner: 125 gm chopped meat, broiled with 20 gm butter, so that it will be slightly raw in the centre;
250 gm mashed potatoes (190 gm potatoes, 20 gm butter, 50 gm milk).

Supper: Same as breakfast.

The patient should be kept on such a diet for at least 3 days.

Macroscopical Examination of the Stools after the Test Meal

We look for mucus, whether on top of the stool (lower part of the colon) or mixed with the feces (originating higher up). To determine the finely mixed mucus in the stools, it is best to rub up the stools thoroughly with water on a black surface. We also look for pus flakes and blood.

Connective tissue in the stools shows diminished acidity or absence of acid in the stomach, provided hypermotility of the stomach or hyperperistalsis of the intestines can be excluded.

Muscle Fibre.—The presence of muscle fibre in large quantities indicates insufficient pancreatic digestion, provided peristalsis of the small intestine is not increased.

In disturbed starch digestion there are numerous small transparent sagolike granules which, unlike mucus, cannot be compressed.

In disturbed fat digestion the color of the stool is light and clay-colored and of acid reaction.

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[3] Deutsche med. Wochensch., 1909, No. 16.

FIG. 7.—Normal Stool After Test Meal.

a, muscle; *b*, soaps; *c*, soaps ("Kringel"); *d*, vegetable; *e*, potatoes; *f*, detritus; *g*, cocoa-rests.

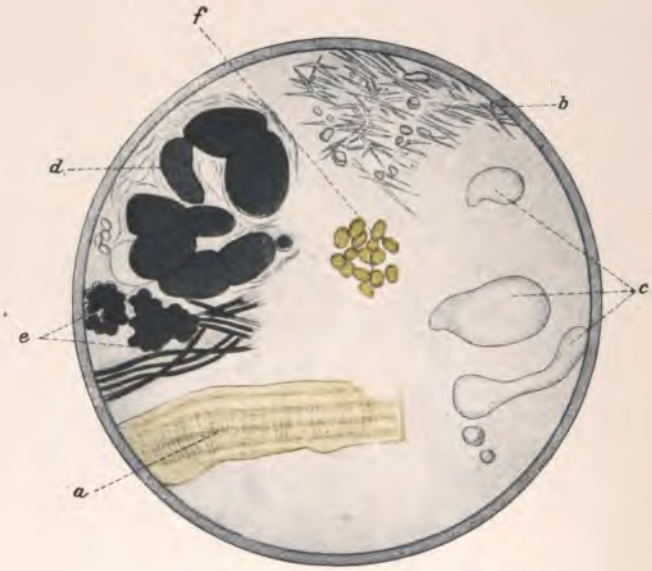

FIG. 8.—Pathologic Stool After Test Meal.

a, muscle; *b*, fatty acid crystals; *c*, neutral fat; *d*, starch; *e*, granulose bacilli; *f*, yeast cells.

Microscopical Examination

Three smears are made:

No. I.—The feces alone, where we can see bacteria, yeast cells, detritus, crystals, muscle fibre, connective tissue, unstained soaps, isolated potato cells. (Figs. 7 and 8, p. 184.)

No. II.—Feces plus a drop of acetic acid and heated for a second. This process melts the fats which, when cooled, recrystallize into fatty acid crystals. If numerous fatty acid crystals are found, the condition is pathologic.

No. III.—Feces plus lugol solution. The starch residue stains blue, while the yeast fungi and some bacilli stain violet, and the yeast cells stain yellow.

The starch in the stools, if in excess, points to a mild disturbance in the small intestine; but when found together with muscle fibre and fat, it indicates pancreatic disturbance.

Chemical Examination

The reaction on litmus paper is normally amphoric or slightly acid. If the reaction of the stools is strongly acid, it indicates carbohydrate fermentation. Strong alkaline reaction points to proteid putrefaction.

The fermentation test of *Strassburger* is carried out as follows:

The feces are placed in a *Strassburger* fermentation tube and put into an incubator and left for 24 hours. Normally, there is only slight development of gas; pathologically, gas is excessive, with a sour odor in cases of carbohydrate fermentation, or an intensely offensive odor in cases of putrefaction.

Procto-Sigmoidoscopy

The examination of the rectum and sigmoid was difficult and incomplete. It is only since *Otis* and *Kelly* have invented a proctoscope and showed the importance of rectal examination that the subject began to attract general attention. Since then *Law*, *Pennington*, *Bodenham* and *H. Strauss* have invented proctoscopes. The one by *H. Strauss* (Fig. 9, p. 186) received wide recognition, as it has all the appliances for diagnostic and therapeutic purposes.

Description of the instrument: the proctoscope consists of:

(1) A tube divided into cm up to 30 cm.

(2) An obturator.

(3) A light carrier.

(4) A glass window to close up the outer end of the tube, so

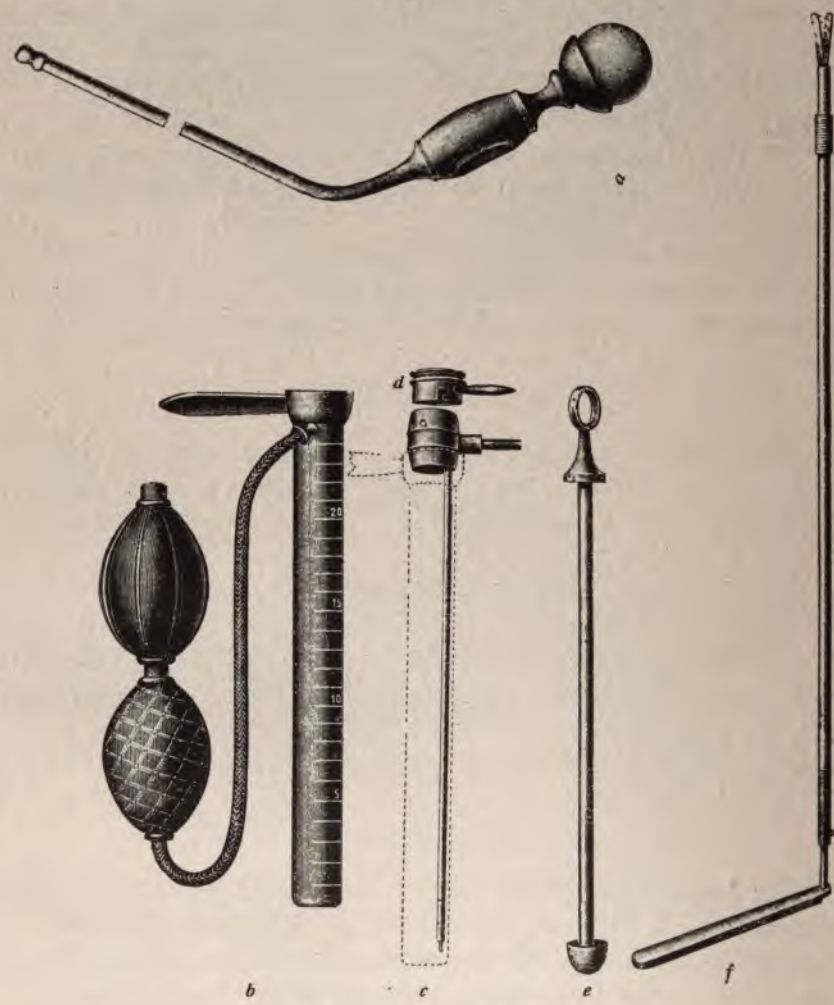

FIG. 9.—Proctoscope (Strauss).

a, Insufflator for powder; *b*, tube, with insufflator for air; *c*, light; *d*, window to close up the tube for air insufflation; *e*, obturator; *f*, applicator.

that when air is insufflated for the purpose of distending the folds of the intestinal mucosa, the air should not escape.

(5) A side opening, to which is attached a rubber bulb to insufflate the bowel.

(6) A bulb with a nozzle the length of the tube, to insufflate powder for treatment.

(7) A long applicator to clean the surface, to apply drugs, and also to remove feces, pus, mucus, or tissue for diagnostic purposes.

Method of Introduction.—The proctoscopic examination should be preceded by a digital examination, in order to determine whether the sphincter ani is rigid or relaxed; at the same time some pathological condition low down can be diagnosed. A low S. S. enema should precede the examination by six or eight hours. The best position of the patient is the knee-chest position. The patient must be told to be obedient when he is asked to press or relax. We now introduce the warmed and well-oiled tube, guided by the obturator, up to 5 cm. Should we at the beginning of the introduction meet with marked resistance of the sphincter ani, or hypersensitiveness, we should overcome it by the application of a 5% cocain solution or a 20% anesthesin salve. Reaching 5 cm, we now withdraw the obturator and introduce the light carrier, close up the outer end by the window, and attach the insufflation bulb. The further introduction of the tube should be guided by sight. In case we note obstruction by folds, we insufflate and proceed.

If we find that the tube meets with marked obstruction, we should not force the tube; if due to a spastic condition, waiting, or applying a little oil on cotton by means of the applicator, will overcome the obstruction. If we do not succeed, we had better give up the further examination for a time. Otherwise we go up to 30 cm, inspecting the mucus membrane as we proceed. As a rule, it is best not to push the tube up, unless 1 cm of lumen is free. Wherever we find considerable rectal bleeding, we had better not use the proctoscope, as we are liable to perforate the bowel.

The aid of the proctoscope in the diagnosis of the large intestine is indispensable in cases of obscure bleeding, suppuration, inflammation of the rectum and sigmoid, as well as ulceration, carcinoma high up, polipy. In treatment, we have a means to apply to the diseased part drugs in powder form, or astringent or anti-

septic solution and cauterization. Other proctoscopes very worthy of mention are *von Aldor's*[4] (see Fig. 10), which is a three-piece proctoscope, and claims the advantage of introducing the length of tubing needed for examination. If we want to go farther, the other parts of the tube are attached. According to this author, the insufflation with air is unnecessary, and hence he has no such arrangement on his tube.

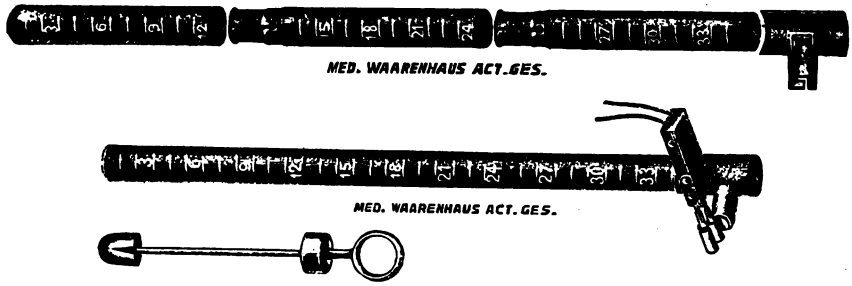

FIG. 10.—Proctoscope (*Aldor*).

Anthony Bassler, New York, has also devised a very practical proctoscope.

Heinrich Stern has also devised a proctoscope with a side-light attachment.

Special Diagnosis and Treatment of the Intestines

ACUTE ENTERITIS

Etiology.—Primary, as a result of faulty diet either in quality or quantity; contaminated water; ice water; infectious influences like summer diarrhea; drastica, chemicals; acids, alkalies, mercury, phosphorus and arsenic. *Secondary*, acute infectious diseases and toxic influences.

Symptoms.—Onset is acute, with a rise of temperature between 101–103° F., nausea, bad taste in the mouth, coated tongue and marked thirst. The chief symptom is diarrhea, which may range from 5 to 15 stools in 24 hours. If the stool is greenish, and there

[4] Medizin. Klinik, No. 3, 1912.

is mucus in small particles and mixed with the feces, it originates mainly from the small intestine, showing that the bile has not been changed.

If the disease is in the colon, larger masses of mucus are on top of the feces and can be readily separated. The diarrhea is preceded and accompanied by pain and there is frequently tenesmus.

There is slight meteorism, and the abdomen is sensitive to pressure, either diffuse or localized. In the latter case the inflammation, too, is localized. In case the duodenum is involved, there may be slight icterus and the symptoms are more gastric in nature.

If the infection is severe, the spleen will become enlarged.

Treatment.—Rest in bed, as long as the fever lasts, is imperative. For the pains, Priessnitz compresses or local hot applications (flax-seed, hot-water bags, thermophore) render good services.

Thirst is assuaged by warm tea, or boiled cold water.

In excessive vomiting it may be necessary to give the tea ice-cold until the vomiting stops, or withhold everything by mouth for 12 hours.

The diet during the febrile stage should consist of strained barley soup, boiled with water for 2 hours, or rice soup prepared in the same way.

When the condition improves we begin with beef juices and gradually proceed to diluted milk with lime water or barley, or peptonized milk, and gradually to other cereals and white meats.

Vegetables and fruit should be excluded for about 2 weeks for prophylactic reasons. When the condition of the patient permits giving meat, we begin with calf's jelly or sweetbread. Red wine, given warm with the tea, 50 to 100 gm at a time, will favorably influence the diarrhea.

Whortleberry wine, in small quantities, has also an antidiarrheal effect.

In the medicinal treatment our first object is to clear the bowels by castor oil—in capsules, if necessary.

If the pains are very severe and not relieved by the above-mentioned methods, we may be compelled to use opium, either as tincture (gtt x) or as extractum opii (0.03) as suppositories. If diarrhea and fermentation persist, bismuth. salicyl. in combination with salol or resorcin is beneficial.

Bismuth. salicyl. 0.5
Resorcin. 0.12
F. pulvis, one every 3 to 6 hours.

Tannigen or tannalbin, tannopin, in doses of 0.5 to 1.0 4 t.d., are beneficial.

Of late, bolus alba (kaolin) has been successfully used for acute enteritis. The dose is 50 to 100 gm in a pint of warm water, to be taken on an empty stomach.

TREATMENT OF CHOLERA NOSTRAS

The dietetic rules are the same as for acute enteritis, but as we are dealing here with an affection that is liable to cause collapse, this should be prevented by active stimulation (camphor, ether, adrenalin, caffein), application of external heat, high colonic irrigation.

For the great loss of water, the continuous Murphy irrigation is very useful. Sometimes transfusion of saline solution is necessary. Bolus alba in these cases sometimes acts as a specific. Aromatic sulphuric acid, in 5-drop doses 3 times daily, and astringents are useful.

CHRONIC ENTERITIS

Etiology may be primary as a result of an acute enteritis or secondary as a result of a diseased stomach, either by extension of the inflammatory process (gastrogenic enteritis) or by food which has not been sufficiently digested entering the intestines and causing irritation (achylia gastrica); prolonged use of laxatives, gastrectasia, carcinoma ventriculi; pancreatic disease; mechanical obstruction of the bowels; biliary diseases interfering with fat emulsification, and enhancing normal peristalsis may all cause enteritis.

It may be secondary to circulatory disturbances and a result of chronic wasting diseases (anemia, tuberculosis).

Symptoms.—Subjectively, the chief complaints are those of pain in the entire abdomen, usually diffuse and varying in character. If the small intestines alone are diseased, the pain is more or less continuous, but not as severe as the paroxysmal pain of the

large intestines. The pain originating in the small intestines is mostly in the lower and middle parts of the abdomen, while the pain originating in the large intestines depends upon what part of the colon is most affected; most commonly, however, it is situated over the cecum and may cause a misleading diagnosis of appendicitis.

There is loss of appetite, lassitude and nausea. Flatulence and meteorism are annoying symptoms; the latter condition being liable to press up the diaphragm, giving rise to palpitatio cordis.

On account of decomposition of the proteids and their absorption, symptoms of auto-intoxication are not infrequent. If the small intestines alone are affected, there is usually constipation; if the large intestines are also affected, there is persistent diarrhea; with the infection confined to the large intestine, constipation as a rule changes with diarrhea.

Objectively, the patient is emaciated, and quickly loses in weight on account of disturbed assimilation and the loss of fluids owing to diarrhea. Sometimes severe anemia is observed. On palpation the abdomen is usually found tender on pressure, the greatest area of tenderness depending upon the diseased part.

With the affection chiefly confined to the small intestines, a gurgling sound is not infrequently detected on tapping the abdomen in the centre. If there is inflammation of the small and large bowels, percussion will reveal a tympanitic note all over the abdomen.

If the inflammation is confined to the sigmoid flexure, there is dulness over that area (*Traube's* sign).

A most important mode of establishing the diagnosis is the examination of the stools after a test meal devised by *Ad. Schmidt* and described in a previous chapter.

The following rules may be laid down for the characteristics of the stools:

If the affection is in the small intestines there will be liquid stools of a greenish-yellow appearance, due to bilirubin, the mucus mixed in the stool being usually glistening and hyaline; it can be broken up by acetic acid.

The stool, on inspection, shows two layers: a grumous sediment of undigested particles of food and a liquid layer above. Microscopically, undigested muscle fibres, starch and fat will be found.

If the disease is confined to the colon, the mucus will be found in larger masses, separated from the feces or covering them; microscopically, there may be no food particles at all. The presence of trypsin in large quantities (by the *Gross* method, as before described), speaks for the disease localized in the small intestines. The *Boas* method of washing out the bowels after a spontaneous bowel movement aids in the diagnosis.

Recto-sigmoidoscopy is an important aid in localizing the affection. Positive inflammatory findings show the affection to be located in the colon.

Treatment.—The therapy must depend on whether there is diarrhea or constipation.

CHRONIC DIARRHEA

The most important part is the dietetic treatment. We first exclude all food that would mechanically, chemically or thermally irritate the intestinal mucosa. Avoid substances rich in cellulose and such that cause fermentation (cauliflower, beets, cabbage, asparagus, salad, rye-bread, especially Graham bread, raw fruit, sparkling water and coffee). Sugar in small quantities is allowed.

The recommendation of milk must be individualized. When the small intestines are chiefly diseased, milk is badly borne; but, if we order milk at all, it should be taken boiled and warm, and to ¼ litre 2 tablespoonfuls of lime-water should be added and taken slowly; or the milk can be peptonized or cooked with a thin cereal. Three or four days' old kephyr has a constipating tendency, because of its high percentage of lactic acid, and a quarter of a litre may be given twice daily, gradually increasing the quantity to 2 litres daily.

In all cases of diarrhea the condition of the stomach must be known.

In gastrogenic diarrhea (achylia gastrica) meat should be excluded for some time. In such cases, *Ad. Schmidt* recommends salicyl. milk, i.e., salicylic acid, 0.25 to 0.5 in 1½ to 2 litres of milk, mixed up when cold and then boiled.

Just as soon as the condition improves and the patient is used to the milk, the addition of salicylic acid is to be discontinued.

Yoghurt is to be recommended, ¼ litre twice daily.

Strawberry milk, i.e., fresh strawberry juice, 3 lbs of strawberries to 1½ litres of milk, taken lukewarm, is often very beneficial in chronic diarrhea; later on the berries may be given as such with the milk.

As the condition improves, zwieback and white meats may be allowed. In milder cases the use of acorn cocoa, prepared in water, is useful for the tannin it contains. *Winternitz* recommends dried whortleberries, cooked, and 1 cup should be taken twice daily. 250 gms of the berries are cooked in 1½ litres of water for 2 hours, then strained through cheesecloth and kept cool.

The condition being chronic, it is important to see that the patient will not be undernourished. The best results can be obtained by putting the patient to bed for 2 to 3 weeks, applying warm compresses, and to begin with barley soup, rice soup, and finally tapioca and sago, all well cooked and strained. Then the yolk of an egg is added to the soup, and finally sweetbread, chopped spring chicken, scraped beef, slightly broiled; and still later small quantities of mashed potatoes, nudles and macaroni.

Whortleberry wine, old Bordeaux or Camarite may be allowed in small quantities. Beer is prohibited.

First Diet List in Severe Cases of Chronic Diarrhea

Breakfast:	200	gm	acorn cocoa in water
	1	soft	boiled egg
10 A.M.:	250	gm	whortleberry juice
12 m.:	250	gm	barley soup, to which 1 egg is added.
	100	gm	scraped lean meat
	50	gm	rice and bouillon
4 P.M.:	250	gm	whortleberry juice
7 P.M.:	75	gm	zwieback
	150	gm	scraped chicken
	250	gm	soup and 1 egg
10 P.M.:	250	gm	barley soup

During the day 200 gm of whortleberry wine is added.

As the condition improves, we allow with the dinner some pudding, not very sweet, and in the afternoon acorn cocoa instead of whortleberry juice; also a greater variety of meats (fillet, roast beef) can be given.

Second Diet for Mild Cases of Chronic Diarrhea, and During Convalescence

8 A.M.:	200 gm	acorn cocoa, with 1 egg
10 A.M.:	250 gm	milk with lime-water
12 M.:	250 gm	barley soup, with 1 egg
	150 gm	broiled chicken
	200 gm	mashed potatoes
4 P.M.:	250 gm	acorn cocoa
6 P.M.:	250 gm	milk with lime-water
8 P.M.:	250 gm	barley soup
	1 egg	
	100 gm	sweetbread
10 P.M.:	250 gm	milk with lime-water

During the day 75 gm of zwieback or toast, 20 gm butter and 250 gm whortleberry wine.

As the condition improves, we allow acorn cocoa cooked with milk; and instead of milk with lime-water we allow cereals with milk.

When the patient begins to walk about, he is ordered to wear a flannel binder around the abdomen, and during the night a Priessnitz compress to the abdomen. Tepid baths are also beneficial.

Of the mineral waters, Vichy, Kissingen, Homburg, Saratoga, taken hot and in small quantities, have a constipating effect. Highly to be recommended are the springs containing a great deal of calcium, such as Wildunger Koenigsquelle, Koburger Marianenquelle, mornings and evenings a wineglassful taken warm. Also calcium carbonate, recommended by *Boas*, ½ teaspoonful 3 t.d., has a good effect.

As to drugs, the bismuth preparations, such as bismuth subcarbonate and bismuth salicyl., also bismuthose, are to be recommended. The tannic acid preparations which are not soluble in the stomach, such as tannalbin, 1.0 3 t.d., are to be recommended. It is always advisable to precede these drugs by a dose of castor oil. The antifermentatives, like the salicylates, salol and bethanaphthol, may be given in combination with the bismuth. For loss of appetite the amara are useful.

Diarrhea as a result of achylia gastrica is favorably influenced by hydrochloric acid and pepsin.

In fat-diarrhea, pancreon, 0.5 3 t.d., is beneficial.

In fermentative intestinal dyspepsia, taka-diastase has been recommended.

In chronic colitis, irrigations with hot water are very beneficial, either as Karlsbad water, ½ litre at a temperature of 105° F., or infusion of camomile at the same temperature, also normal saline solution. Whortleberry juice can be used as enema, warm, and to be retained.

Tannin and silver nitrate should rather be avoided on account of their irritating effect.

Ad. Schmidt has lately been using oxygen as a local disinfectant by means of the *Gross* duodenal tube.

ENTERITIS MEMBRANACEA

While authors still differ as to whether enteritis membranacea is to be separated from colica mucosa, we are inclined to agree with those who consider each of these affections as an entity.

In enteritis membranacea we find besides the characteristic paroxysmal attack of pain and expulsion of mucus in large masses, signs of anatomical changes such as undigested particles of food and mucus in the *Boas* intestinal irrigation test.

In colica mucosa, on the other hand, the attacks have a similar character, but there are no catarrhal signs, although this affection may in the course of time become an enteritis membranacea.

Enteritis membranacea is more frequent in women. Abuse of laxatives and medicated enemas (tannin, glycerin, alum, silver nitrate) are often responsible. It is also frequently associated with *Stiller's* habitus.

Symptoms.—The discharge of large masses of mucus, ribbon-shaped or cone-shaped, and the paroxysmal attacks of pain which are relieved with the discharge of mucus.

Usually obstinate constipation, although later there may be diarrhea.

There is pressure pain over the sigmoid, with dulness (*Traube's* sign) and sometimes tenderness over the whole abdomen.

The stools, as already mentioned, contain, besides mucus, undigested particles of food, and mucin obtained with the *Boas* intestinal irrigation method.

They also show marked disturbance of assimilation. Sometimes there is intestinal sand, consisting of magnesium and calcium salts.

Treatment.—In this affection a non-irritating diet is essential; according to Ewald, it should consist of well-cooked and strained cereals in milk, sweet cream and butter, soft boiled eggs, toast, zwieback, white meats, puddings not very sweet; restrict the vegetables, especially those rich in cellulose. Compots should also be given sparingly; raw fruit, spices and rye-bread are prohibited.

For the pain, hot local applications, belladonna suppositories. Opium should not be given because of its constipating effect.

For the constipation, the *Fleiner* oil treatment is indispensable; it not only exercises its evacuating effect, but it is also soothing to the intestinal mucosa. For method and length of time, see p. 72.

If the oil enemas alone are not sufficient, high colonic irrigations with normal saline or camomile infusions may follow the morning after the patient has evacuated the oil.

CHRONIC CONSTIPATION

While chronic constipation is only a symptom, we find it so frequently an independent affection that we deem it important to consider it in a special chapter. The X-ray examination of *Holzknecht* [5] in a healthy person showed that the peristalsis of the colon advances the feces in 24 hours only one-third of the colon, and then in a few seconds in three interrupted downward propulsions the feces have passed the entire colon.

It was shown skiagraphically that in constipation this process of propulsion is markedly impeded, particularly the downward propulsion of the feces.

Etiology.—The causes are chronic intestinal catarrh, nonjudicious use of cathartics, irregular habits as to diet (excessive use of meat), insufficient intake of fluids, and vegetables, disturbed gastric function (atony), lack of exercise, suppressing stools on account of social environment, or not going regularly to stool, anemia, chlorosis, obesity, stasis in the portal circulation, weak abdominal muscles, fe-

[5] Münch. med. Woch., 1909, No. 47.

male pelvic disorders, diseases of the brain and spinal cord, hysteria and neurasthenia.

Symptoms vary: According to *Zuntz*,[6] the intestinal gases are taken up by the blood and exhaled by the lungs which, according to *Rosenheim*, causes fetor ex ore.

Besides, toxins are found as a result of putrefaction, giving rise to symptoms of autointoxication.

The symptoms referable to the nervous system are vertigo, headache, migraine, lassitude, rarely attacks of psychosis and unconsciousness.

Epstein observed epileptic attacks as a result of constipation. The same author also reports distinct cardiac affections due to constipation.

Symptoms due to local pressure by the scybala (coprostasis) causing sciatica, lumbago, distinct pressure pains in the region of the appendix or around the flexure, are very common.

Bladder symptoms and other genito-urinary irritation may result from pressure of the scybala in that location.

Attacks of rises of temperature on account of autointoxication is nothing infrequent. The colon bacilli may cause pyelitis by way of the lymphatics or the circulation. Skin symptoms: urticaria, erythema, acne, are often observed; vasomotor disturbances, flushes, rise of blood pressure on account of splanchnicus irritation, are observed.

It has been the custom to divide constipation into an atonic and a spastic type, until *Boas* [7] took the stand that such a division did not fully agree with the clinical picture. Lately, *Ad. Schmidt* [8] has agreed with *Boas*. While he does not deny the existence of a spastic constipation, he states that it is never primary. It starts as an atonic constipation, as a result either of using up the food too well, or due to the fact that the patient does not partake of sufficient as well as the proper kind of food ("alimentary constipation," *Boas*), finally, on account of irritation by scybala, spastic contraction of the transverse and more so of the descending colon and sigmoid flexure results.

Whether these two forms of constipation can be separated, is being studied radiographically by *Holzknecht*, and while the conclu-

[6] Deutsche med. Wochensch., 1884, No. 44.
[7] Mediz. Klinik., 1908, No. 39. Archiv. f. Verdauungskrankh., Vol. XV.
[8] Intern. Beitr. z. Pathol. u. Therap. d. Ernährungsst., Vol. III, No. 1.

sions cannot be drawn as yet, he is of the opinion that atony and spasticity coëxist in different parts of the colon: the proximal atonic and the distal spastic.

From a clinical standpoint the status and nature of the patient may suggest to us the kind of constipation we have to deal with.

We frequently find people with the status apoplecticus, or those showing a generally diminished tone, like flabby musculature, suffering from the atonic type of constipation.

Individuals of the so-called hypertonic type, from childhood already inclined to spastic conditions, like twitchings, laryngismus; pseudoangina in early adult life—these individuals tend to spastic constipation.

The appearance of the stools will often disclose the predominance of the existing state, whether spastic or atonic.

While in the atonic constipation the feces are dry, round and fairly large, we find in the spastic type ribbon-shaped and pencil-formed, or "sheep-stool"-formed.

Aside from the symptoms mentioned above, patients with spastic constipation also have a sensation of distention of the abdomen and sometimes slight cramps before moving the bowels.

Objectively, the spastically contracted colon can often be palpated.

A less frequent cause of chronic constipation, first described by *Payr*,[9] is the benign stenosis of the splenic flexure of the colon on account of adhesion forming at this location, thereby narrowing the angle between the transverse and the descending colon.

The same author describes a characteristic clinical entity.

Due to the fact that the feces lodge in the colon transversum down the cecum unusually long, these parts dilate and give rise to distention, tenderness over the cecum and colon transversum. Dilatation is finally followed by hypertrophy of the colon.

There is a constant pain in the region of the splenic flexure. Constipation is here obstinate, and from time to time there are distinct intermissions of massy, semiliquid stools mixed with hardened scybala and a great deal of gas.

In rare cases symptoms of acute ileus and even fecal vomiting may occur.

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[9] Verhandlungen d. Kongresses f. innere Medizin, Wiesbaden, 1912, S. 276.

On X-ray examination we find the stenotic part absent and the scybala in the colon like a row of pearls in the haustra. The transverse colon pressing on the stomach gives rise to a defect in filling, sometimes compressing the greater curvature of the stomach. In cases where the scybala have caused stercoral ulcers we find, after the bowel is emptied, small masses of bismuth adhering to the ulcerated areas.

Such conditions are often taken for carcinoma.

Treatment.—The same as for spastic constipation described above.

If, after a sufficient length of time, treatment is not effected, surgical interference, to break up the adhesions, must be resorted to.

Prophylaxis: Laxatives being such an important factor in producing habitual constipation, we must caution the mothers against the abuse of laxatives in their children. The same caution must also be used with adults.

The curse of patent and proprietary laxative drugs should as much as possible be removed by the family physician. Regulation of physical exercise, diet, habits, ought to be observed from childhood.

Treatment is chiefly dietetic and physical, while the medicinal treatment is ultima ratio. Avoid all food that has a constipating effect, such as cocoa, chocolate, rice, red wine, strong tea.

Milk, when taken boiled, happens to have a constipating effect, but this can be overcome by the addition of a tablespoonful of milk-sugar.

In addition to the milk, we allow one day old kephyr or buttermilk during the day.

While most authors direct the diet in constipation according to whether there is hyper- or hypoacidity or impeded motility of the stomach, we feel, if we can reasonably exclude the motor and secretory disturbance to be a primary factor, that we should only consider the constipation, treating it as such, and the gastric secretory and motor disturbances will subside.

Other articles of diet are fruit, raw, and cooked, pumpernickel and Graham bread, cakes baked with honey, plenty of butter and sweet cream. Vegetables like cauliflower, cabbage, salad, carrots, spinach; also cream cheese, white wine and cider.

With some patients, a glass of cold water on an empty stomach

acts on the intestinal peristalsis. In others, the smoking of a cigar has a similar effect.

If this diet is not sufficient, a tablespoonful of sugar of milk in the morning or honey with the breakfast will be beneficial.

In cases of flatulence, peppermint or fennel tea will overcome the trouble.

A DIET LIST FOR ATONIC CONSTIPATION

Breakfast:	300 gm	buttermilk
	20 gm	butter
	30 gm	honey
	100 gm	Graham bread
Dinner:	Soup	
	200 gm	meat
	300 gm	cauliflower or other vegetables
	200 gm	prunes
	150 gm	cider and 100 gm of Graham bread
5 P.M.:	Coffee	
	150 gm	Graham bread
	30 gm	honey
	20 gm	butter
Supper:	White meat or fish and vegetables	
	30 gm	butter
	150 gm	Graham bread
	300 gm	apple compot, or raw fruit

If that does not suffice, massage and faradic electricity may aid. Sometimes intrarectal galvanization is useful. Proper exercises, like mountain climbing, horseback riding, rowing, will also be beneficial.

Hydrotherapeutics in form of douches, cool sitz baths, are useful, especially for neurotic individuals.

In the beginning of the treatment for obstinate constipation, we cannot expect the diet alone to be entirely effective, and it is therefore best to help it along by a low enema of normal saline of 1 pint, if the natural movement is not satisfactory or if there is no movement at all.

If circulatory disturbances are the cause of the constipation, a cure with sodium sulphate or magnesium sulphate, 2 teaspoonfuls in hot water every morning, is beneficial. For the same purpose the bitter waters may be used.

To start the treatment for chronic constipation, it is practical to begin with a laxative in order to once thoroughly evacuate the bowels, such as castor oil, calomel, cascara.

Of the innumerable drugs recommended for constipation, we will only mention them as a caution not to use them for any length of time, if at all, because the patient gradually acquires the habit and finally may lead to catarrhal changes in the gastro-intestinal tract. The drug that is the least injurious and is, according to *H. A. Hare*, not habit-producing, is the fluid extract of cascara sagrada; this is to be used in gtt xxx doses up to 1 teaspoonful, and we should gradually reduce the dose until our patient will get along without it. Podophyllin, colocynth, aloes, rhubarb, should rather not be used at all. The usefulness of agar-agar and phenolphthalein, as well as hormonal, and the mode of their use have been described on p. 98.

The treatment of the spastic type of constipation, as far as the diet is concerned, should, according to *van Noorden*, in most cases be the same as that of the atonic type.

We must convince our patients that, according to the aforenamed author, the abdominal pain which he experiences at times is mostly the result of his constipation, and the latter again the result of his fear to eat; and merely by following the prescribed regimen of diet his constipation will be overcome.

Olive oil, in tablespoonful doses or more, 3 t.d., before meals, or sweet cream instead, in the quantity of ½ litre, in divided quantities with the meals, has a beneficial effect in such cases, firstly by its nutritive properties, and secondly by overcoming the hyperacidity usually associated with these conditions.

Should the patient at the beginning not stand the diet well, the "sparing diet" (Schonungsdiät) may for a short time be used, i.e., excluding the coarse vegetables that leave much residue, and giving toasted white bread instead of the Graham and rye bread.

Diet List

Breakfast:	300 gm	milk and cream
	200 gm	white bread
	2 soft	boiled eggs
	30 gm	butter

Dinner:	200 gm	fillet
	100 gm	mashed potatoes
	200 gm	spinach
	200 gm	apple compot
	50 gm	cream
5 P.M.:	200 gm	milk
	30 gm	sugar of milk
	100 gm	white bread
	30 gm	butter
Supper:	200 gm	cold meat
	100 gm	white bread
	30 gm	butter
	50 gm	cream
	Carrots purée	

Physical treatment, in the form of massage, electricity or active exercise, is contraindicated in the spastic type. Baths should be taken warm. Priessnitz compresses are also beneficial at bedtime. Belladonna, 0.02, as suppositories is effective. Such patients are sometimes benefited by a modified rest-cure, which consists in keeping them in bed for 1 week entirely, and later allowing them to take an hour's rest for a few weeks after each meal, lying down on the right side.

Change of climate is indicated in some cases.

While the *Fleiner* oil treatment (see p. 72) is very useful in the atonic form of constipation, it is almost indispensable in the spastic form.

As a substitute for the oil treatment, the *Lapowski* paraffin method may be used (see p. 74).

Boas and *Strauss* recommend the use of rectal suppositories of cocoa butter, 8 to 10 cm long and 3 to 4 cm round; they should be retained overnight.

Teal and others recommend the gradual dilatation of the sphincter ani by means of bougies in order to overcome the spasm of the sphincter.

INTESTINAL AUTOINTOXICATION.[10]

The chemical and pathological studies of autointoxication are only of recent date. Numerous biological experiments have demonstrated the fact that autointoxication constitutes a clinical entity.

[10] *Combe:* "Intestinal Autointoxication," Rebman Company, New York.

We must, however, exclude autointoxication as a result of pyemia, uremia, absorption of ulcerated cancer, the breaking up of the proteids, fat and nucleins as a result of wasting diseases or diseases of the liver, also disturbances of the internal secretory organs (thyroid, epitheloids, hypophysis, suprarenal bodies).

The food, besides being acted upon by the normal digestive secretions, undergoes changes by the bacteria which further the digestion of carbohydrates, proteids and fats for absorption, and the rest to form end-products to be thrown off with the excretions. So we find the formation of hydrogen sulphite (H_2S), the end-products of carbohydrates, lactic and butyric acid, and the end-products of proteids, aromatic substances (indol, scatol). We therefore see that the microbes have partially a digestive property and partially a poison-forming property; the latter, when not excessive, has no ill-effect. If the poisonous products exist in excessive quantities in the intestines, they are doubly deleterious; first because of their above-mentioned chemical qualities, and second by their high molecular value, influencing the osmotic pressure and blood pressure.

The end-products of carbohydrates and fats are chemically not sufficiently known; their poisonous influence consists of symptoms known as acidosis. They are present in the urine as acetone, diacetic, lactic and oxybutyric acids, and the alkalinity of the blood is diminished. Besides this acidosis, resulting in diabetic coma, there is acidosis of intestinal fermentation in children and in the fermentative dyspepsia (*Ad. Schmidt*) in adults.

The proteid putrefaction depends upon the quantity of the remains of the unchanged proteids and the activity of the anaërobic bacilli in the alkaline medium of the large intestines (B. putrificans, (*Bienstock*); B. putridus).

The aërobic bacilli in the colon also display, under favorable conditions, a putrefactive action. The most poisonous end-substances of the proteids are kreatinin, xanthin and purin. Indol is only found when there is stasis in the small intestines.

The question arises how does the organism protect itself against poisonous substances produced by fermentative putrefaction? This protection is brought about by the normal chemical and motor function of the stomach and the antiseptic property of the bile.

The intestinal mucosa by its secretion, and the epithelia by their antitoxic properties.

A diseased epithelium favors autointoxication.

The liver, which converts the toxic products into less toxic substances (tyrosin, tryptophan and ammonia into urea; and the nuclein and purin substances into uric acid).

There is probably an antitoxic action by the organs of internal secretion.

Etiology.—Excessive use of meat, insufficient chewing, improper gastric digestion, acute stasis in the cecum or colon, as a result of kinking of the flexure (enteroptosis); spastic conditions of the colon; diseased intestinal mucosa, parasites, insufficiency of the liver (infectious diseases, or cirrhosis of the liver).

Symptoms may point directly to the gastro-intestinal tract or chiefly to the nervous system.

In the first group we find the feces of extremely offensive odor, ptyalism, attacks of vomiting, congestion of the liver, slight jaundice.

To the second group belongs migraine, eclampsia, particularly in children, nervous asthma, angio-neurotic edema and other skin eruptions, circular disturbance (palpitation, arrhythmia, angina pectoris), and anemia; temperature variations.

The urine shows most frequently indican in excess and indol-acetic acid.

Treatment.—Therapeutics must meet two objects: first, diminish the putrefaction; second, try to strengthen the protective elements of the system.

To accomplish the first object, we must chiefly rely on a diet that does not produce putrefaction, and the one that answers best is the lacto-carbohydrate diet.

At the beginning it is even well to substitute the milk by kumys, kephyr or yoghurt. Of the starchy foods, only the cereals, like barley, rice and thin flours, are to be used. Food rich in albumen should be withdrawn, at least for one week. After that, fresh soft boiled eggs and finally small quantities of white meats are allowed. Meats rich in nuclein, like liver, kidney, brain, sweetbread and the others that tend to rapid decomposition, like fish and dark meats, are prohibited. Where there is no symptom of enteritis, vegetable purée may be allowed, or cooked fruit in purée form.

In chronic autointoxication, we may order as a daily routine to take either kephyr, kumys or yoghurt; meat as little as possible, with the avoidance of the above-mentioned meats. It is advisable once or twice a week to leave out meats entirely and substitute fresh soft boiled eggs and more carbohydrates.

The following drugs are recommended for such cases: bethanaphthol, bismut. salicyl., salol, ichthalbin.

The bowels should be kept open, and it is best to resort to castor oil from time to time; also calomel will have to be used sometimes.

In order to meet the second indication, i.e., to strengthen the protective elements of the body, it is often advisable to have the patient change the climate, or go to a spa, as Kissingen, Saratoga, Karlsbad, by which the antitoxin-producing organs, like the glandular system and the intestinal mucous membrane, are stimulated to better activity and the eliminative organs are incited to better action.

Metabolism can also be aided by sweat baths, hot packs and other hydrotherapeutic procedures.

CHAPTER VII

Ulcers and Other Diseases

DUODENAL ULCER

Ulcer of the duodenum is more frequent than ulcus ventriculi, according to *Mayo* and *Moynihan*. The ulcer is sharply defined, of varying size; the largest reported were of the size of a silver dollar.

It occurs most commonly singly. Its most frequent situation is on the upper horizontal branch of the duodenum. It occurs more rarely in the other portions of the duodenum, but sometimes it may spread from the duodenum to the pylorus.

Etiology.—Duodenal ulcer occurs during the ages of twenty-five and fifty and more frequently in men than in women. A number of cases have occurred before ten years of age.

Alcohol and tobacco are predisposing factors, according to *Ewald* and *Boas*. Extensive skin burns and erysipelas, septicemia and chronic appendicitis have been said to be predisposing factors.

As direct causes, the theories that hold good for the causation of gastric ulcers would also hold good for duodenal ulcer.

Symptoms.—Sometimes the disease may be latent, and hemorrhages from the bowels alone or combined with hematemesis may be the first symptom.

Pain is the earliest manifestation, most commonly with the following characteristics: It comes on two to three hours after meals; greatest pain at the right parasternal line, at the lower edge of the liver (duodenal region). The pain radiates downward and to the loin.

The pain may sometimes be epigastric and immediately occur after meals, so that there is great difficulty in differentiating it from gastric ulcer. Other differential points in the pain between duodenal and gastric ulcer are that in the former the pain is not relieved by vomiting and is not frequently relieved on partaking of food.

Chvostek called attention to the fact that wine relieves the pain, because of the pylorus closing and not allowing the food to go to the duodenum. The so-called hunger-pain is present in both gastric and duodenal ulcer, but the pain is more severe in the latter.

Periods of intervals free from pain are not infrequently due to the ulcer being in a quiescent state.

Vomiting is not as frequent as in gastric ulcer.

Hemorrhage in the form of hematemesis is rare, but by way of the intestine it is very frequent, mostly in the form of occult blood. These small hemorrhages, if persistent, may lead to marked anemia. Mild jaundice is a frequent occurrence, due to associated duodenitis by the catarrhal extension to the papilla Vateri. Deep and persistent jaundice points to ulcer being localized near the hepatic and pancreatic ducts or that the adhesions formed by the ulcer extend to that locality.

Other gastric symptoms, like epigastric pressure, nausea, loss of appetite, and marked regurgitation, while they may occur, are, as a rule, not so frequent as in gastric ulcer.

As to gastric findings, authors disagree. *Moynihan* and others found most commonly hyperacidity and hypersecretion. *Ewald*, on the other hand, did not have any uniform findings.

The most frequent complications of ulcus duodeni is its spread to the serosa, causing localized peritonitis with continuous pains, finally leading to perforation; with symptoms of shock which is soon followed by a general peritonitis, and if surgical interference is not effected, death results in from twenty-four to thirty-six hours.

Perforation may occur posteriorly, forming adhesions and abscess formation either below the diaphragm (subphrenic abscess) or into the pleura (pyopneumothorax).

Perforations into the liver, pancreas, abdominal aorta, mesentery and portal vein, hepatic artery, and adjacent colon, have been reported. The perforation is more frequent in duodenal than in gastric ulcer, on account of the thinness of the duodenal wall.

Another complication is the cicatricial formation causing stenosis, which, if lower down in the duodenum, leads at first to dilatation of the duodenum above the diseased area, and even to diverticulum formation.

A case observed by one of us (*Gross*), confirmed by the duodenal

and X-ray examinations, showed dilatation of the duodenum as a result of ulcer.

Later, this stenosis leads to gastrectasis.

Carcinomatous degeneration is a very rare occurrence.

Diagnosis.—Strong, healthy men, of middle age, have attacks of pain two to three hours after meals, hunger pains, slightly to the right and radiating to the loin; some degree of jaundice and occult in the stool make the diagnosis fairly positive.

The *Gross* duodenal tube serves as a diagnostic aid, as it was shown that if blood is macroscopically found in the duodenal contents, the diagnosis is positive; while the absence of blood does not exclude duodenal ulcer.[1]

The *Einhorn* bucket with a silk thread, when stained with blood at the seat corresponding to the duodenum, aids in the diagnosis.

The differential diagnosis from ulcus ventriculi has been discussed already. Cholelithiasis is differentiated by the pain not being dependent on the ingestion of meals; it is much more severe, and radiates up to the right shoulder; it is relieved by vomiting; there is often slight temperature associated with the attack; more frequently there is an enlarged and sensitive liver, particularly ***Riedel's*** lobe.

Jaundice cannot serve as a differential guide. In differential diagnosis we must guard against mistaking duodenal ulcer for chronic appendicitis. In the latter, the greater tenderness being over *McBurney's* point, the gastric symptoms, like nausea, loss of appetite, are more marked; constipation is more obstinate and, when the latter is relieved, the symptoms are milder.

It must be borne in mind, however, that both conditions may coexist.

Prognosis.—Less favorable than in ulcer of the stomach, because of its tendency to perforate.

Therapy.—Is the same as in ulcus ventriculi (see p. 131); control of hemorrhage, rest, rectal feeding, *Leube* cure, bismuth medication and the Karlsbad water cure.

Surgical interference is indicated if the ulcer does not readily yield to medical treatment.

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[1] Medical Record, April 22, 1911.

In cicatrization of the ulcer causing stenosis of the pylorus, surgical treatment gives the best results, as a rule. In perforation of the ulcer the results are the more favorable the earlier the patient is operated on.

OTHER ULCERATIVE INTESTINAL DISEASES

Nothnagel[2] points out in his classical description that intestinal ulcer may exist without any symptoms whatever, and that even symptoms and signs, when they do exist, are not in proportion to the pathological post-mortem changes. As a positive sign of existing ulceration of the intestines the presence of pus and tissue is essential. However, as pus cells are destroyed before reaching the rectum, we find pus only when the lesion is in the lower portion of the colon or rectum. The same holds good for disintegrated intestinal tissue.

Evacuation of pure blood is most common in typhoid and dysenteric ulcers, while in other forms of ulcer the blood is usually mixed with pus.

If blood is found unmixed and we can exclude hemorrhoids, polypi or fissures, we must presuppose intestinal ulcer. Occult blood, if gastric conditions and hemorrhoids and other sources of bleeding can be excluded, is due to ulceration of the intestinal mucous membrane.

Pain, while usually present, is not a characteristic symptom of intestinal ulceration.

Localized pressure pain would point to the ulceration being in that particular region.

There is usually diarrhea, but sometimes there may be constipation, especially so when the disease is high up in the intestines. Decomposed pus gives the stool an extremely fetid odor.

Ulcers of the intestines are divided into:

a, catarrhal; c, syphilitic, gonorrheal;
b, stercoral; d, tubercular;
e, dysenteric.

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[2] "Zur Symptomatologie der Darmgeschwüre," Volkmann's Sammlung klin. Vortr., 1881, No. 200.

(a) *Catarrhal ulcers* are usually the result of a prolonged catarrh of the intestines; they have the size of a pinhead to a ten-cent piece, and develop from the follicles; the ulcerated follicles are distinctly visible proctoscopically. They are chiefly localized in the colon, very seldom in the small intestine.

When dealing with chronic enteritis, if diarrhea is increasing considerably without yielding to dietetic treatment, the diagnosis of catarrhal ulceration is justified; it is still more strengthened by the presence of pus and blood in the stools.

(b) *Stercoral* (*decubital*) *ulcers* are the result of constipation; they are mostly localized in the flexures, cecum and rectum, because of the pressure exerted by the scybala. A rare complication is perforation.

(c) *Specific ulcers* (*syphilitic* and *gonorrheal*): of these the syphilitic are more common. They are the result of ulceration of gummata and are mostly localized in the rectum.

Gonorrheal ulcers are very rare and are also most commonly situated in the rectum.

(d) *Tubercular intestinal ulcers* are very rarely primary; most commonly they are secondary when patients suffering from pulmonary tuberculosis swallow their sputum and so infect their intestines; or they may occur by way of the lymphatics on account of diseased mesentery glands or by direct extension. These ulcers lie transversely to the long axis of the intestines; they are liable to heal by fibrous tissue formation or lead to circumscribed peritonitis and adhesions, but seldom to perforation.

In the ileocecal region, the tubercular ulcer is liable to lead to considerable infiltration and fibrous tissue formation with a distinctly palpable mass in that location, which will make it difficult at times to differentiate it from carcinoma or abscess of the appendix, or in females, diseases of the adnexa.

The most common location is the ileum and cecum, very seldom above or below that location.

The symptoms are not characteristic; at times, however, there is an uncontrollable diarrhea, and the stools are mixed with blood and pus.

The presence of tubercle bacilli in the stools is only significant if the disease is primary in the intestines. If the disease is in

the flexura, infiltration with characteristic ulcera may be seen rectosigmoidoscopically.

(e) *Dysenteric ulcers* may be found associated with acute infectious diseases (puerperal fever, variola, cholera asiatica) and mercurial poisoning. Tropical dysentery is an amebic disease, while the dysentery of Europe and Japan is due to the *Kruse-Shiga* or *Flexner* bacillus.

Kruse also speaks of a still milder type, which he calls pseudodysentery of bacterial origin.

Dysenteric ulcers are almost exclusively found in the form of small, irregular areas with undermined edges; the mucosa between the ulcers is inflamed. Perforation and stenosis are very rare. Tropical dysentery very often leads to abscess of the liver. In tropical dysentery we find eosinophilic leucocytes in the feces, and also a general eosinophilia.

Treatment.—For catarrhal ulceration, treatment is the same as for catarrhal enteritis (see p. 196). For stercoral ulcers, which are characterized by constipation alternating with diarrhea, a suspension of bismuth subgallate in oil (15.0:250.0), used as an enema daily, preceded by intestinal irrigation; the bismuth suspension to be retained overnight.

For syphilitic ulcers, specific treatment is effective.

Gonorrheal ulceration, which is most commonly localized in the rectum, will be dealt with in the chapter on proctitis and sigmoiditis.

For tubercular ulcers of the intestines the treatment consists in rest, hot local applications, a well-nourishing constipating diet; sometimes change of climate is very beneficial.

As to drugs, the astringents tannalbin, xeroform, tannigen, or dermatol may be tried; also calcium in combination with the above-mentioned drugs. Ichtoform, in doses of 1.0 to 2.0, 3 t.d., has been recommended. The creosote preparations may be tried.

The use of enemas in these conditions is to be cautioned against, because of their irritating effect upon the mucous membranes.

The dysenteric type, due to the *Kruse-Shiga-Flexner* bacillus, has been favorably influenced by a serum devised by *Kruse*, as has been reported by many authors.[3]

[3] *Kruse* and *Shiga*, Deutsche med. Woch., 1901, No. 43, and 1903, No. 2.

As to drugs, magnesium sulphate, in doses of 1 to 2 gm every 2 hours for adults, and 0.2 to 0.5 for children, is beneficial in mild cases.

Disinfectants and astringents (salol, bism. salicyl., tannigen) are to be used later on.

During the febrile stage the patient is kept in bed, warm compresses are made to the abdomen, and nothing but strained cereal soups cooked in water may be given. Opium suppositories, 0.01, are useful for the tenesmus. In amebic dysentery (entameba hominis, *Schaudin*), *Axisa*[4] advises the use of "korsam," brucca sumatrosa, given in tablet form, one every hour. According to this author, the blood disappears from the stools in 5 days, and in uncomplicated cases complete recovery takes place in 10 to 15 days.

In the chronic type, high colonic irrigation with tannin 1:500, or normal saline, or very weak silver nitrate solutions, 1:5000, may be tried.

Iodoform enemas, in the strength of 6.0 to mixtura gummosa 600.0, of which 200 cc is mixed with 1½ liters of warm water, preceded by intestinal irrigation.

If there are signs of iodoform poisoning, its use is to be interrupted, or in cases of idiosyncrasy it is to be discontinued. Quinine (1:5000), in the form of an enema, has also been recommended.

Ipecac treatment.—Rest in bed for about 2 weeks.

Diet.—Mostly liquids, and light salads. Castor oil is given as an initial purgative. Ipecac, to be given in capsules which are coated ⅛ of an inch with salol. The first dose is 3 to 4 gr after a four hours' fast. The dose is reduced by 0.3 gr every evening, until 0.7 gr is reached. Then 0.7 gr per day is administered for the next 2 weeks.

Emetin Treatment of amebic dysentery.

Leonard Rogers[5] reports a number of cases of amebic dysentery that he successfully treated with the alkaloid of ipecac: emetin hydrobromate, with the advantage of not causing the nausea and vomiting produced by ipecac.

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[4] Arch. f. Verdauungskr., 1910, Vol. XVI.
[5] British Med. Journal, Aug. 24, 1912.

He uses the drug subcutaneously, 0.03 two to three times the first day, and if there is no improvement he doubles the dose twice for the next day. Treatment is continued for several days until the symptoms disappear.

Rogers lays such great stress upon the efficacy of the drug that in cases where the treatment is ineffective he excludes amebic dysentery.

E. Libman treated a case of amebic dysentery in the Mount Sinai Hospital with the method outlined by *Rogers*, with very satisfactory result.

Flushing of the bowels with chinin. sulphur., 1:5000, increasing to 1:1000, to begin when the 0.7 gr dose is reached. The enema is applied with the hips elevated; the rectal tube is introduced 3 to 4 feet and the enema is to be retained for 15 minutes.

Rutherford [6] recommends the use of olive oil, 2 tablespoonfuls 3 t.d. Of late, bolus alba in water, taken internally, starting with 50 gm and decreasing to 10 gm daily, has been recommended.

The French school recommends lacto-bacillin or yoghurt in the early stage. We would recommend, for a few days' use only, acorn cocoa cooked in water, lean bouillon with an egg, tea, strained barley soup and zwieback. When the patient's condition is improved, we allow scraped beef, mashed potatoes and farina with milk. Later, broiled chicken, fillet, beefsteak, spinach, rice or farina pudding, and veal cutlets may be given. The patient is to avoid for a long time all food rich in cellulose, cold drinks, sparkling drinks and spices. Milk, if borne well, is allowed with lime-water. As to alcoholic drinks, red wine may be taken warm; whortleberry wine or juice is also useful.

Complete recovery is rare. Only a strictly regulated hygienic and dietetic life, with an annual visit to one of the spas, may make the patient comfortable.

Should the treatment as outlined above not be successful, and should there be a tendency of the condition becoming worse, surgical interference in the form of colostomy is to be advised.

It is important to remember that these patients are sometimes carriers of the bacillus and so spread the disease.

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[6] Amer. Med., March 12, 1904.

SIGMOIDITIS

The inflammation is not infrequently localized in the sigmoid.

The condition may be acute, or the acute process may change into a chronic condition.

Etiology.—The predisposing factor is in many cases coprostasis and extreme change of temperature. The direct cause, according to *Rosenheim*,[7] is an endogenic infection as a result of bacterium coli. *Zweig* [8] considers it a bacterial disease, but the nature of the bacteria is not known.

Symptoms.—General symptoms are usually mild; there is slight elevation of temperature, nausea, loss of appetite. The chief complaint is the pain over the abdomen, most localized over the sigmoid, which is sensitive to pressure.

There is tenesmus, a frequent desire to move the bowels, with the result of expelling only small quantities of feces mixed with mucus and bright red blood.

The sigmoidoscope materially aids in the diagnosis, but as we are dealing with an acute condition, the use of the sigmoidoscope must be exercised with great caution.

By sigmoidoscopic examination we usually find a congested mucous membrane, easily bleeding, and areas of erosions and punctiform exudates.

The disease may entirely subside or lead to chronic ulceration or formation of exudates with palpable masses in the sigmoid or adhesions to the adjacent organs.

Treatment.—Rest in bed, Priessnitz, in some cases when the pain is very severe hot poultices are beneficial, or in other cases the ice-bag is more appropriate. Calomel in divided doses 0.03 every ½ hour, until 0.25 is taken; this is followed by castor oil in order to evacuate the bowels. If the tenesmus continues to annoy the patient, suppositories of opium with belladonna, āā 0.03, are beneficial.

If tenesmus and abdominal pain persist notwithstanding the outlined treatment, lukewarm irrigations with normal saline or infusions of camomile tea are useful. In cases of persistent bleeding, gelatin infusion, 20: 150.0, by enema, is useful.

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[7] Deutsche med. Wochensch., 1908, Nos. 7 and 8.
[8] Arch. f. Verdauungskr., 1908, Vol. XIV.

The diet should consist of strained barley soup, tea, cocoa cooked in water, egg albumen and no milk for the first 3 to 4 days. When patient improves, milk should be given, either peptonized or with lime-water or cereals; beef-juice may be given later, or scraped beef and toast.

Patient should keep away from raw fruit, coarse vegetables, rye bread and spicy food for at least a few weeks after the acute attack.

When the acute stage has passed into chronicity, we usually find that the patient has periods of comfort alternating with periods of abdominal cramps with tenderness of the sigmoid. Sometimes, a mass may be felt in the region of the sigmoid due to an exudate; in other cases the whole sigmoid is found to be a rigid tube.

There is usually constipation; the discharges are mixed with blood, mucus, and sometimes even pus. The sigmoidoscopic examination discloses ulcerations of various sizes, while other parts of the mucous membrane may be found atrophic.

Treatment.—If constipation is present, the oil treatment (see p. 72) is very efficacious.

If the discharges of mucus and blood persist, irrigations with hot normal saline or sometimes the addition of mild antiseptics like boric acid, or retaining enemas of bismuth-oil emulsions, 30:150 or 100 are indicated. The local application of dermatol or xeroform in the powdered form through *Strauss'* sigmoidoscope is useful, or the ulcers may be touched up with 1:5000 silver nitrate.

For greater hemorrhages, gelatin injections are beneficial (30:150). The diet is the same as described for ulcerative enteritis (see p. 192).

Hydrotherapeutic procedures in form of Priessnitz compresses at night and warm sitz baths are beneficial. Woollen flannels should be worn next to the skin as a protection against change of temperature.

In cases which do not yield to the treatment as outlined above, appendicostomy or anus preternaturalis may become necessary.

PROCTITIS

may be either acute or chronic, and associated either with colitis or enterocolitis, or occur as an independent disease. As a primary

disease it is the result of an infection (gonorrhea), of foreign bodies, of worms, or it may be a deuteropathic manifestation following carcinoma, ulcers, strictures and hemorrhoids.

Symptoms.—In the acute form there is painful pressure in the rectum, the pain radiating to the sacrum, the thighs, hips, bladder and genitals. Tenesmus, especially during defecation, and a discharge of sanguineous muco-purulent secretion, cause erosions of the anus.

There is frequently some elevation of temperature. In the chronic form the symptoms are about the same, except that they are intermittent and less intense, and there is no elevation of temperature.

Digital examination will disclose spasm of the anus. Rectoscopy can only be carried out successfully with a 10 to 20% anesthesin salve or a 2% cocain salve around the anus, to overcome the spasm, when the rectal mucosa will be found swollen, glistening and in many places covered with mucus and blood.

Should a digital examination disclose a mass, we are dealing with periproctitis, which becomes fluctuating when an abscess forms.

Treatment should be directed to remove the underlying cause. For gonorrheal proctitis, injections of ½ to 1% protargol or 10% argyrol prove very effective. It is also important to diminish intestinal peristalsis, and in this condition opium suppositories are often indispensable. The daily movements should be obtained by low normal saline enemas.

Other local antiseptics that must be resorted to at times are boric acid solution (2%) or sodium borate (2%).

For chronic proctitis, a 1% solution of silver nitrate, in the form of a spray for the rectum, is very efficacious. Lukewarm sitz baths for 5 or 10 minutes have a beneficial effect, particularly so on the tenesmus.

PROCTITIS EOSINOPHILIA

Fricker[9] calls attention to a form of proctitis characterized clinically by mucus and blood in the stools.

The microscopical examination of the mucus shows a large

[9] Archiv für Verdauungskrankheiten, Heft 5, 1912.

number of eosinophile cells; and there is likewise an increase in the eosinophile cells of the blood. Proctoscopically, he finds a congested mucosa in the rectum and S. romanum. He considers the condition a constitutional one, analogous with the congestion of the bronchial mucosa in bronchial asthma. With so much greater reason does he consider prostitis eosinophilia analogous with bronchial asthma, as he even found *Charcot-Leyden* crystals in the stools.

The chief objective is a diarrhea, and what concerns the patient most is that he sees blood and mucus in the stools.

Another characteristic feature is that the attacks occur periodically.

Treatment.—During the attack, rest in bed with a bland diet and the use of bismuth internally. It is also essential to encourage the patient by stating that the disease is not organic and that he will completely recover.

PRURITUS ANI

is often associated with proctitis, sometimes with hemorrhoids or chronic constipation. Frequently it is of reflex origin as a result of affections of the uterus, intestinal worms; sometimes it is of vasomotor origin, diabetic pruritus probably belonging to the latter type. The same is true of pruritus of neurasthenics and hysterics.

Treatment.—First remove the underlying cause. Locally, lotions of 3 to 5% of carbolic acid solution or washing with warm water and soap, followed by 80% alcohol or 1% bichloride.

Applications of 5% protargol or 5% cocain, 10% anesthesin, may be useful.

Menthol or thymol, 3%, chloroform salve, 10%, are recommended by some; also

Sulphur salve, 3%.
Or Silver nitrate solution, 2%.
Or Protargol solution, 5%.
Or Acidi carbol. 1.0
Chloroformi 2.0
Vaselini 17.0
S. Salve.

Or Zinci sulphur 0.4
Anesthesini 2.0
Lanolini 20.0
S. Salve.

Or Olei juniperi ..... gtt. xx
Mentholi 0.4
Spir. concentr. 4.0
Lanolini ..... ad 20.0
S. Salve.

Or Protargoli 2.0
Solve in aqua fervida 5.0
Adde
Unguent. peruviani 5.0
Lanolini ..... ad 20.0
S. Salve.

FISSURA ANI

usually occurs as an oval or elongated superficial abrasion of the mucosa, usually at the edge of the anus at the posterior commissure and seldom higher up.

The diagnosis is readily established by inspection.

Treatment.—Remove constipation by a dose of castor oil. After that, opium suppositories are indicated to quieten peristalsis. Locally we can use dermatol as powder, aristol or, best of all, orthoform. If the condition is very painful, a 10% anesthesin salve, together with 5% orthoform, is useful. The 5 to 10% protargol salve has a promptly beneficial effect.

If all the remedies mentioned above are not effective, we can apply tct. iodini, preceded by a 2% cocain solution or pure ichthyol in the same manner. Sometimes silver nitrate in 10% solution is beneficial. Stretching of the anus under general anesthesia may become necessary in obstinate cases.

ULCERS OF THE RECTUM

(1) Follicular or catarrhal.

(2) Syphilitic (ulcus durum or broken-up condilamata or necrosed gumma).

(3) Gonorrheal.
(4) Dysenteric.
(5) Tubercular.
(6) Traumatic (enemas, foreign bodies, scybala).

The characteristic signs of the different types of these ulcers are the same as those described under intestinal ulcers.

Therapeutics.—In syphilitic ulceration, specific treatment is indicated.

For the tubercular type, aside from the local treatment, hygienic, climatic, and dietetic treatment, as well as the use of tuberculin in appropriate cases are important.

Local treatment here as in other diseases of the rectum; evacuation of the bowels should be followed by arrest of peristalsis by the use of opium.

Spasmus ani and tenesmus are treated as described above. The same holds good for local applications and irrigations.

STRICTURE OF THE RECTUM

The stenosis of the rectum may be caused by pressure from without (tumors of the pelvic organs), or by strictures as a result of cicatrization of syphilitic and dysenteric ulcers, seldom of gonorrhea.

The *diagnosis* is best made by digital examination.

The *treatment* consists in regulating the bowels by diet and enemas, followed by symptomatic treatment for tenesmus and spasmus ani.

For the local condition gradual dilatation with appropriate sounds should be instituted. Fibrolysin injections may be tried.

Surgical interference is sometimes unavoidable, but the results are often disappointing, as fistulæ and incontinentia of the levator ani may result.

PROLAPSUS RECTI

may be either limited to the mucous membrane of the anus, in which case we speak of prolapsus ani, or the entire rectum may prolapse, in which case we speak of prolapsus recti. Under very rare

conditions the sac of Douglas may prolapse, carrying with it higher portions of the colon, ovaries or bladder, in which case we speak of rectal hernia.

The predisposing factors for these conditions are weakened sphincter ani and weakened abdominal muscles. As a result of general weakness it mostly occurs at the age of two to three years; and predisposing factors here are constipation, diarrhea, colitis, proctitis, severe cough (pertussis).

The predisposing factors in adults are hemorrhoids, proctitis, rectal polypi and laceration of anus or rectum during labor.

Treatment.—First remove the underlying cause; then apply symptomatic treatment for tenesmus, pruritus, pains, etc.

Medicinally, injections of ergotin, 0.1, or strychnin, 0.001, are indicated, in order to tone up the sphincter. Sometimes a properly devised rectal pessary (*Esmarch* model) may be useful. If all the above methods are ineffective, surgical interference may be necessary.

HEMORRHOIDS

We understand by hemorrhoids varicosities of the veins around the lower part of the rectum. According to their location we differentiate external and internal hemorrhoids. The former are situated externally of the sphincter ani, the latter internally of the sphincter ani.

Etiology.—Chronic constipation due either to pressure in expelling the feces or to scybala exerting pressure on the veins.

Other causes are chronic diseases of the rectum, diseases of the prostate, pregnancy, general stasis, and particularly stasis of the portal system.

Not infrequently hemorrhoids are associated with plethora.

The disease is more frequent in men than in women.

The *symptoms* differ. In some patients there is only a feeling of pressure and heaviness in the rectum; others would suffer of pruritus ani, and still others would have symptoms of discomfort and pain after defecation.

If the hemorrhoids become eroded, blood, mucus and pus will be found in the stools.

With internal hemorrhoids, the only symptom is bleeding which,

as a rule, is not profuse, but the continuous minute oozing may lead to a high degree of secondary anemia.

If the protruded hemorrhoids swell up and become strangulated, they give rise to a great deal of pain.

The diagnosis is always made by inspection and palpation. They may be seen either bulging out or as knots, varying in size from a pea to a walnut and often surrounding the anus in rosette form. On account of thrombus formation, they are liable to shrink, or sometimes lime deposits would form in the veins, causing thrombolites. Seldom will they lead to fistulæ and abscesses, and extremely rarely to carcinoma.

Treatment.—First we must treat the underlying cause. Locally, we must meet four indications:

(1) Involution.
(2) Overcoming the bleeding.
(3) Relieving the pain.
(4) Overcoming complications.

The first indication we try to meet by the iodine preparations, such as the following:

Iod. puri	0.2
Kalii iodati	2.0
Glycerini	35.0

S. Apply on cotton and introduce into the rectum.

Or Iod. puri	0.025
Kalii iodati	0.25

Butyr. cacao q. s. ad suppos. No. I.

Or Iod. puri	0.5
Kalii iodati	5.0
Glycerini, Ichthyoli, āā	10.0
Aquæ	ad 150.0

S. Inject 10 c.c. into the rectum mornings and evenings, to be retained as long as possible.

Anusol suppositories owe their effect to the iodine they contain.

To meet the second indication to control the hemorrhage, some recommend styptics internally in the form of fl. ext. of hamamelis, 1 teaspoonful 3 t.d.

The best method is local application. We can use as such

Hamamelis virginia	0.3
Butyrii cacao	10.0
Olei amygdal.	7.5

S. Ext.

Fl. ext. of hydrastis may be used externally. Adrenalin chloride, 1:1000, applied on cotton into the rectum or in the form of suppositories.

Gelatin, 10%, is also used for the same purpose. Ice-cold irrigations, or irrigations with tannin 1:500, or liquor ferri sesquichlor. 1:100, may be tried.

The third indication is met by the use of the salves or suppositories made of narcotics and anesthetics, such as 10% anesthesin salve, 1 to 2% cocain salve, or suppositories of cocain (0.02) and opium (0.03), mixed.

To meet the fourth indication, namely the complications, in cases of strangulation, we must try to reduce the hemorrhoids which must be preceded by applying a soothing salve (20% anesthesin salve or 5% cocain salve). Sometimes it is possible to reduce the swelling by application of ice, but this should not be applied for longer than an hour at a time, as it is liable to lead to gangrene.

If this does not accomplish the purpose, application of leeches (not on the knots) will often cause the reduction of the strangulated hemorrhoids.

Local application of liquor Burrowii or lead-opium lotion may be tried for the same purpose.

If the bleeding is very profuse, tight packing of the rectum is very important.

As to surgical treatment, a method the physician can carry out in his own office is the injection of a 50% carbolic solution in glycerin into each hemorrhoidal knot, observing the most aseptic precautions; then patient is advised to stay in bed for two to three days, on a fluid diet. Tct. opii, 20 drops 3 t.d., is administered during that time to arrest peristalsis. In case of the hemorrhoids recurring, surgical treatment must be resorted to.

Boas [10] advises the use of calcium chlorati in a 10% aqueous solution, of which 20 cc are injected into the rectum every morning.

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[10] Therap. d. Gegenw., July, 1904.

The same author [11] also recommends that the patient should press out the hemorrhoids, without replacing them. This procedure causes stasis and edema, which leads to shrinking and often healing.

For the accompanying pain he uses either 5% cocain salve or anesthesin 20%.

Diet in Diseases of the Rectum.—We must select a diet poor in residue, so as not to irritate the rectum, and it is advisable to give milk and strained cereals for a few days or even a week; alcoholic beverages and spices are to be avoided. After the first week the diet may be of a mixed form, but it should not be irritating.

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[11] Arch. f. Verd. Krankh., Vol. XV, No. 2, 1909.

CHAPTER VIII

Tumors and Other Affections

BENIGN TUMORS OF THE ANUS AND RECTUM

Around the anus and rectum tumors are sometimes found which, according to their clinical and pathological behavior, must be considered benign.

The tumors of the anus are chiefly papillomata. They are the result of irritation, and they appear in the form of cauliflower, or as condylomata. Fibromata and cysts are also sometimes met with. They differ from carcinoma by not having an infiltrated base.

Treatment is surgical; thorough removal, and after-treatment until completely healed, to prevent recurrence.

Of the benign tumors of the rectum, the most frequent are the polypi. They may occur in any part of the intestines. Their chief seat of predilection is the rectum. The most frequent forms are the adenomata; they are usually pedunculated, sometimes protruding; they are soft and vascular, hence they bleed easily; they occur singly and often multiple. They vary in size, the largest being that of a walnut. They may be so numerous that they invade sigmoid and colon, as well as the rectum.

The chief symptom is that of bleeding, sometimes being so profuse that a severe secondary anemia results. In some cases the excessive number of polypi may give rise to symptoms of acute ileus. Otherwise there is usually a sense of fulness in the rectum and tenesmus. Sometimes they give rise to catarrh of the intestine, causing corresponding symptoms.

Diagnosis must be aided by the proctoscope.

Prognosis.—Even under treatment recurrences are very common. Inanition as a result of bleeding is not infrequent. They frequently degenerate into malignancy.

Etiology.—The exact cause is not known, although pre-existing catarrhal conditions and irritation by scybala are claimed by some to be predisposing factors.

Francis Huber, of New York, associates the affection with status lymphaticus, based on the fact that it is frequently associated with adenoids and tonsils. This view is also shared by *Gant*.

In the tropical countries it is found as a result of distoma hemotorum.

Treatment.—If the polypi are few in number, and low down, complete removal is possible. For those sitting higher up, cauterization through the sigmoidoscope, or local application of hemostatics or tampons for the bleeding may be tried. In some cases colostomy must be done in order to successfully treat the lower part of the bowel.

Lipoma, fibroma and dermoid cysts of the rectum are of very rare occurrence. Diagnosis is made by digital examination and rectoscope. Treatment is surgical.

MALIGNANT TUMORS

Carcinoma of the Intestines

This usually occurs between the ages of 40 and 60, and is more common in men than in women. Eighty per cent. of the cases occur in the rectum, 15% in the flexures of the colon and in the cecum, 5% in the small intestines. Heredity plays an important part.

General Symptoms.—Intestinal pains, the intensity of which depends upon the character of the cancer, are common. If the growth obstructs the lumen of the bowel, it will give rise to colicky pains, like those of ileus. If, on the other hand, the growth breaks up, the pains are milder in character and there is a sensation of distention.

At times vomiting is associated with the pains, and there is even fecal vomiting with the symptoms of ileus.

The intestinal function varies. When the tumor breaks up, it gives rise to diarrhea; with the tumor obstructing the lumen, constipation predominates; frequently constipation and diarrhea alternate. There is also tenesmus in carcinoma of the rectum.

The character of the feces differs according to the seat of the lesion and the state of the tumor.

Indican and indolacetic acid are found in the stools when the tumor is in the small intestine, rarely when in the large intestines.

Further symptoms are gastric disturbances, visible intestinal peristalsis, cachexia.

Of very great importance is the feeling of the tumor. A tumor of the small intestine is usually movable; a tumor of the colon transversum and the sigmoid flexure is slightly movable; while the tumors of the cecum, ascending and descending colon, are not movable at all. Localized meteorism may aid in localizing the tumor. Splashing sounds over the small intestine and dulness on deep percussion point to stenosis of the small intestines. The presence of tumor particles in the feces, especially after irrigating the bowels following a spontaneous evacuation, aids in the diagnosis, but is of rare occurrence.

Special Symptoms.—Carcinoma of the duodenum occurs in about 1 to 2% of the cases. If, aside from the general symptoms, there is vomiting of regurgitated bile-stained contents, associated with the gastric symptoms, suspicion of duodenal carcinoma is justified. In rare cases a hard, uneven, immovable, painful tumor may be palpated in the right hypochondrium.

The diagnosis of carcinoma of the jejunum and ileum is made with great difficulty. Aside from the general, two special symptoms may be pointed out as important aids: the splashing sound in the region of the small intestines and the presence of indican and indolacetic acid in the stools and urine.

Carcinoma of the Sigmoid Flexure

A most important diagnostic aid is furnished by the rectosigmoidoscope when cancer is situated in the sigmoid flexure.

It should not be forgotten that carcinoma of the large intestine may run its course without any symptoms, and the occurrence of ileus would be the first symptom.

Carcinoma of the rectum is very frequent, and the one most rapidly progressing is the so-called *Gallert* carcinoma, which even occurs before the thirtieth year of age.

The *symptoms* of rectal carcinoma may be those of proctitis: heaviness in the rectum, tenesmus, discharge of mucus and blood with the stools.

The duration of the scirrhous type is from 3 to 5 years; that of the *Gallert* type 1 to 2 years.

The diagnosis entirely depends upon the digital examination of the rectum and the proctoscope, the latter revealing reddening, swelling and increased secretion of mucus.

The tumor itself shows hard edges, and from the centre there are seen secretions of blood, mucus and pus. In the majority of the cases it forms an obstruction to the further progress of the proctoscope.

Diagnostically it is important to note that the digital finding of small nodules in the anterior wall of the rectum points to metastases which make operative interference late.

Insufflation of the intestines often aids in localizing the tumor.

A very important aid in localizing a stenosed portion of any part of the intestines is furnished by the X-ray examination of the intestine (see p. 305).

Complications of carcinoma of the rectum are adhesions with neighboring organs, metastases (liver, peritoneum), thrombi and emboli.

Treatment is only surgical, as soon as the diagnosis is made. According to various authors the favorable results of operation vary between 22% and 28%.

Internal treatment ought to be instituted only where the case has passed beyond surgical interference, and its chief aim can only be to give the patient comfort.

Other malignant diseases of the intestines are lymphoma and sarcoma, but they are extremely rare.

We wish here to caution that all symptoms pointing to a disease of the anus or rectum should lead to a thorough examination of that region by inspection, digital examination and proctoscopy.

ILEUS

Etiology

I.—Mechanical Ileus with anatomical causes:

(1) Obturation Ileus.

a.—Coprostasis;

b.—Foreign bodies in the intestines (enteroliths and gallstones);

c.—Scar formation (intestinal ulceration);
d.—New-growth (cancer, etc.).

(2) Compression Ileus from neighboring organs.

(3) Strangulation Ileus.
a.—Invagination;
b.—Volvulus;
c.—Angulation;
d.—Kinking caused by peritoneal bands or adhesions;
e.—Internal and external Hernias.

II.—Dynamic Ileus, without any direct anatomical causes:

(1) Ileus paralyticus as a result of intestinal paralysis, caused by atonic constipation, trauma, meteorism, peritonitis, emboli and thrombi of the mesenteric vessels.

(2) Ileus spasticus, from spasms of the intestines as a result of spastic constipation, also hysteria, and reflexly by foreign bodies and ulcers of the intestines.

Symptoms.—The most important symptom is pain, which is usually persistent, localized in the region of the umbilicus, and only temporarily relieved after vomiting.

In chronic obstruction, there may be intervals free from pain.

Another very important symptom is local tenderness to pressure which later becomes diffused; toward the end of the disease the pain may cease in all forms of ileus.

Meteorism is very marked, particularly when the ileus is localized in the large intestine.

At times, localized meteorism is liable to be present above the seat of the obstruction.

Vomiting is a constant symptom, the vomitus consisting at first of the stomach contents, later of bile and finally of fecal matter.

Usually, there is absolute constipation, not even flatus being passed.

Bleeding of the intestines points to volvulus or invagination. In such cases there may even be hematemesis.

There is oliguria or sometimes complete anuria; indican and indolacetic acid are found in the urine.

The general appearance of the patient shows the facies Hippocratica, anxious expression, eyes sunken in, rapid respiration of the costal type; the pulse becomes weak, rapid, soft and arrhythmic. The second aortic sound is absent.

Finally, there is complete collapse, and death occurs within 2 or 3 days, unless there is very rapid relief.

Diagnosis.—In making the diagnosis we must decide (1) whether ileus exists; (2) where it is situated; (3) what its nature is, whether it is an obturation ileus, that is an occlusion of the bowel caused by mechanical obstruction of the lumen, in contradistinction to a strangulation ileus where the lumen is narrowed by pressure from without.

In an obturation ileus in the large intestine we must think of coprostasis chiefly localized in the cecum, hepatic flexure and sigmoid flexure.

The obturation due to foreign bodies in the intestines are chiefly enteroliths or gall-stones, which latter are usually localized in the duodenum or jejunum, causing persistent presence of bile in the stomach, vomiting, severe colicky pains, and frequently icterus, marked tenderness over the duodenum and sometimes a palpable mass.

The condition arises suddenly. If the stones localize lower down in the ileum, the indefinite symptoms of stenosis of the small intestine set in. Rarely do gall-stones cause stenosis in the large intestine. There stenosis is mostly caused by enteroliths.

Foreign bodies introduced into the rectum by psychopathic individuals, or swallowing large quantities of seeds, may cause obstruction.

Compression ileus also occurs suddenly, and it is possible that a tumor of the pancreas may obstruct the duodenum, or a tumor of the mesenteric glands may cause ileus of the jejunum and ileum; a psoas abscess may cause ileus of the cecum, tumors of the adnexa causing obstruction of the rectum. A dermoid cyst on the posterior wall of the rectum causing obstruction was removed by *S. Roth*, New York. Ileus caused by a fish-bone in the cecum was operated by *L. Buerger.*

In every case of strangulation ileus, the onset is sudden, beginning with severe colicky pain.

Frequently the cause of the ileus is an invagination of one part of the bowels into the other, which may be either one part of the

small intestine invaginated into the other part of the small intestine, invaginatio enterica or invaginatio colica, one part of the colon into the other, or invaginatio ileocecalis. It occurs at every age, especially, however, in the first decade.

The ileocecal invagination is the most frequent.

In the invaginated part, circulation is usually interfered with, leading first to hyperemia and consequent bloody stools, and finally to necrosis which, under favorable circumstances, may be thrown off through the rectum in form of a large necrosed mass.

Diagnostically, the sudden onset, the bloody stools, the severe pain, tenesmus, and the feeling of a tumor in the ileocecal region—the most frequent location—are very significant.

In *volvulus*, the bowel is turned on its own axis by 180°. The most frequent seat is the sigmoid flexure. A congenital, unduly long mesentery is a predisposing factor. Other causes may be prolonged constipation, increased peristalsis and trauma.

The clinical picture is extremely acute. Sudden onset, severe colicky pain, vomiting and obstinate constipation. These symptoms are soon superseded by symptoms of shock. There is also a very marked distention, and facies Hippocratica is usually present.

Internal hernias that cause obstruction are: those of the obturator foramen, sciatic hernia, perineal, rectal, vaginal, lumbar, diaphragmatic, duodeno-jejunalis, vesical, omental hernias and those of the broad ligament of the uterus.

To the dynamic type of ileus belongs the paralytic form, where there is a paralysis of the intestines of either myogenic or neurogenic origin, as it sometimes occurs in atonic constipation, extreme meteorism, emboli and thrombi of the mesenteric vessels, or in trauma when there is post-operative ileus.

In making a diagnosis of ileus, all accessible foramina must be examined for hernia. A rectal examination should be made with finger and proctoscope, or, if possible, proctosigmoidoscope, also a vaginal examination. Water should be injected into the rectum, and if it is found after injecting 500 cc that it quickly returns, the colon not being able to hold any more, we are justified in suspecting an obstruction. Insufflation of air may also aid in the diagnosis, and this measure may even have a favorable therapeutic value.

Treatment.—In acute ileus, when due to intussusception, or vol-

vulus, the earlier the patient is operated on, the better the prognosis. But even in such cases, if the operation is for some reason not indicated, or in cases where the diagnosis is not certain, internal remedies should be applied, carefully watching the development for 8 to 12 hours, so as not to lose valuable time.

The internal treatment consists in high colonic irrigations of 1 or 2 litres, and more, of normal saline solution, with the patient in the knee-chest position, using the high rectal tube and going up as high as possible. According to *Nothnagel*, carbonic acid injections, 1 glass to ½ litre should be tried. The carbonic acid can be substituted by a Seidlitz powder dissolved in 2 glasses of water.

Large quantities (1 pint) of olive oil or, according to *E. G. Janeway*, castor oil in the same quantity can be used.

To arrest vomiting, especially when fecal in character, nothing surpasses lavage of the stomach.

In regard to medication, atropin is the drug *par excellence* for adults, in doses of 1 to 2 milligrams until 8 milligrams are reached. Poisonous symptoms can be overcome by opium. The favorable results of atropin in ileus are now confirmed by many reliable observers.

For the extreme meteorism external application of hot turpentine stupes is beneficial. The intestines must often be punctured at the highest point of the distention.

Physostigmin salicylate is recommended, in doses of 0.001 hypodermically, chiefly in post-operative ileus. Of late, hormonal-Zuelzer (intravenously 20 cc) has been found useful in post-operative and dynamic ileus.

In ileus of the chronic type, due to mechanical obstruction from without or within the lumen of the intestines, surgical interference is the only curative procedure.

TYPHLITIS

Before describing appendicitis proper, the so-called typhlitis, where the inflammation involves the cecum alone, will be briefly mentioned. Typhilitis is more common in men than in women, and occurs most commonly in the ages of 20 to 40. It is frequently the result of chronic constipation, and is analogous to sigmoiditis. It is characterized by pressure pain in the ileocecal region, slight meteorism;

a palpable fecal mass in the same region is often found and a moderate elevation of temperature. The blood count shows no leucocytosis and no polynuclear increase.

Laxatives, especially in the form of castor oil and high irrigation of the bowels, usually relieve the condition.

Complications like appendicitis are rare, and still rarer is perforation.

APPENDICITIS

Etiology.—Riedel [1] attributes two important conditions to the causes of appendicitis, viz.: 1. *Fecal stones with erosions.* 2. *Granulations* (appendicitis granulosa hæmorrhagica). The former most commonly leads to pus formation and the latter to connective tissue formation. These conditions must not be confounded with the acute catarrhal appendicitis.

Perforations occur most commonly in those forms caused by fecal stones. Constipation is a predisposing factor.

The bacteria that are most commonly responsible, are the colon bacillus, staphylococcus aureus, bacillus pyocyaneus, staphylococcus albus. In very rare cases fruit seeds, hair, fish-bones and enteroliths are responsible. Heredity is considered a factor. Trauma has also been considered a predisposing cause. English authors consider rheumatism and gout predisposing elements. In a number of cases appendicitis was associated with influenza, and the influenza bacillus was the causative factor. It was often found associated with tonsillitis.

Position of the Appendix.—The length of the normal appendix is between 5 and 9 cm, although appendices of 24 cm have been reported. The location of the appendix varies; most commonly it is situated in the right iliac region with downward direction; sometimes, however, it may be situated in the lumbar region, sometimes upward in the hypogastrium and sometimes in the pelvic cavity.

The abnormal positions as well as abnormal length predispose to inflammation. Another predisposing factor that assists the appendix to become inflamed and even gangrenous, is the fact that the appendix has a poor blood-supply.

Acute appendicitis has 3 distinct types: (1) simple catarrhal

[1] Arch. f. klin. Chirurg., 1902, Vol. LXVII.

appendicitis with or without involvement of the local peritoneum; (2) perforative appendicitis accompanied by a suppurative peritonitis either encapsulated or diffuse; (3) gangrenous appendicitis. Between these 3 principal groups there are intermediary pathological forms, such as the ulcerative type, without perforation and without gangrene, or an exudate within or around the appendix.

Under rare circumstances there is also a tubercular appendicitis, very seldom primary and most commonly secondary to tuberculosis of the cecum. Also actinomycosis of the appendix has been met with. Carcinoma of the appendix is also met with.

Chronic Appendicitis.—All the layers of the appendix may become thickened as a result of previous acute inflammation or, as is very often the case, adhesion with adjacent organs takes place as a result of localized peritonitis.

Symptoms vary according to the type of the disease. There are cases where indefinite gastro-intestinal symptoms predominate, and the diseased appendix is only accidentally found at the operation; such cases are termed by *Ewald* appendicitis larvata.

There are other types where the symptoms point to a disease of the adnexa, or the symptoms are those of the urinary bladder, and the complaints of cystitis may continue until a sudden attack of an acute appendicitis discloses the exact cause of the disease.

Another frequent form is the one known as appendicular colic. Here the pain sets in suddenly, is colicky in character, localizes itself in the ileocecal region and is associated with nausea and vomiting. The cause of the colic is accumulation of secretion and frustrate contractions of the overdistended appendix; or it may also be caused by appendicular adhesions encircling the cecum and giving rise to mechanical obstruction.

The symptoms of the *acute attack* usually set in abruptly with severe abdominal pains at first in the region of the umbilicus, later localizing themselves in the ileocecal region. The patient has often a chilly sensation at the beginning, very seldom an actual chill; this is followed by an elevation of temperature; there is slight nausea, usually vomiting.

Constipation is the rule; very rarely there may be some diarrhea. Objectively: On inspection we find the patient lying on his back, the right leg slightly flexed, in order to relax the right rectus ab-

dominalis. In a great number of patients the expression of the patient indicates the severity of the infection. The tongue is coated.

The pulse corresponds to the temperature most of the time, and the same holds good of the blood picture to be mentioned later. On palpation a sense of resistence in the right iliac region is present (défence musculair).

Pressure on the ileocecal region, over *McBurney's* point or the *Lanz-Morris* point, causes pain. The latter is a line drawn from one anterior-superior spina to the other; the painful point corresponds to the right third of the line. But the finding of neither point does not exclude appendicitis, because the malposition of the appendix may cause the pressure-pain in the bladder region, right lumbar or right hypochondriac region respectively. Rectal examination or recto-vaginal examination in women should not be neglected, as frequently a mass on the right side can be felt by that route.

All these symptoms may entirely subside within 24 hours, which tells us that we were dealing with a catarrhal appendicitis. In other cases the fever continues, the pulse becomes quicker, the leucocytes increase, with an increase in the polynuclear cells, likewise the local tenderness and the local resistance. Even now improvement is liable to occur.

Should, however, the abdomen show some distention, vomiting continue and the tenderness be more marked, the left side also becoming tender on pressure, we are dealing with a peritonitis.

In cases where the pain has subsided completely, but vomiting is still present, and the leucocyte count increases still further, gangrene has certainly set in. Where the appendix has perforated, we have besides the local signs manifestation of either local or generalized peritonitis.

Other signs are hyperesthesia of the skin in the ileocecal region; in other cases pressing over the appendix gives no pain, but the sudden removal of the compressing hand gives rise to pain. The feeling of a mass in the region of the appendix may be due to a sero-fibrous exudate, most commonly to an encapsuled abscess.

In the fulminating form of appendicitis the symptoms are from the start alarming, being those of peritonitis (meteorism, singultus) and sepsis.

Importance of Leucocytosis.—The importance of leucocytosis for

early diagnosis of appendicitis has been shown by *Sonnenburg* and *Körthe*. They showed the relation of pulse, temperature and leucocytes to the severity of the case.

In simple appendicitis, the temperature is 100° F., pulse 92, leucocytes 15,000. In ulcerative appendicitis, temperature 101° F., pulse 112, leucocytes 22,500.

Between such cases there are some that are mild in the beginning, while on the second or third day the leucocyte count goes up. Where a suppurative peritonitis has taken place, the leucocyte count may be as high as 30–50,000. If, with a general peritonitis, there is no leucocytosis, it speaks for lowered resistance.

Other complications besides peritonitis during the course of acute appendicitis are ileus, thrombi and emboli; possibly the involvement of lung and pleura are of an embolic nature. Subphrenic abscess may also result; furthermore, hemorrhages from the stomach and bowels.

Chronic Appendicitis.—Besides the few atypical cases of chronic appendicitis mentioned above, we meet clinically a distinct type of chronic appendicitis.

The symptoms are those of a gastric nature: fulness in the epigastrium, capricious appetite, eructations, coated lung. There are symptoms of reflex pylorospasm causing a delay in the emptying of the stomach. A prominent symptom is constipation.

Diagnostically, tenderness over *McBurney's* point is persistent; sometimes, if the appendix is thickened, we can feel it, also by rectal and vaginal examination. Often the most tender point is in the region of the kidney, in cases of retrocecal appendicitis. *Kuttner* insufflates the colon, and in cases of increased tenderness over the appendicular region, it speaks for chronic appendicitis.

Differential Diagnosis.—The following diseases are to be considered: diseases of the gall-bladder, liver, right kidney and ureter and, above all, tumors and inflammation of the female pelvic organs. Also carcinoma and tuberculosis of the cecum have to be differentiated from appendicular abscess.

Appendicitis may sometimes be confounded with gall-stones, especially so when the appendix points into the hypogastrium, giving rise to pain in the right hypochondrium. The differential points, however, are that in gall-stones the pain mostly radiates to the right

shoulder, while the appendicular pain mostly radiates to the umbilicus. No icterus in appendicitis and the presence of leucocytosis.

Stones in the right kidney and ureter may be mistaken for appendicitis, particularly when the appendix points into the lumbar region, but here the absence of temperature in the former, also the absence of leucocytosis, the pain upon urination, the urinary findings, such as red blood cells, and the X-ray will clear up the diagnosis.

With the inflammatory conditions of the pelvic organs, particularly of the right adnexa, appendicitis is often differentiated with great difficulty, since appendicitis is frequently associated with diseases of the right adnexa. The rectovaginal examination materially aids in the diagnosis.

A mass that can be traced to have originated in the pelvic cavity, points to involvement of the pelvic organs.

Carcinoma of the cecum is differentiated by the palpable irregular mass in the cecal region, also cachexia, absence of temperature and leucocytosis.

Tuberculosis of the cecum is differentiated by the mass having a stronger resistance, the prolonged duration, less acute pain, the general appearance, the tuberculin test in adults and the *von Pirquet* test in children. The finding of tubercular manifestations in other organs and the finding of tubercle bacilli in the feces, provided we can exclude the swallowing of the tubercular sputum by the patient.

A fecal mass in the cecum must be thought of which is differentiated from an abscess of the appendix by the absence of temperature in the former; no leucocytosis and a laxative or an enema will remove the fecal mass.

Typhoid fever early in the disease may give considerable pain in the appendicular region. The most important differentiating point is the leucopenia.

Lobar pneumonia, especially in children, will often begin with abdominal pain, meteorism, vomiting, and only a careful examination of the lung will make the diagnosis.

Treatment.—Acute appendicitis is by all means a surgical disease.

According to all statistics the most favorable operative results are obtained when the case is operated early before localized peritonitis and other complications have set in, and in the interval operation.

During the two periods mentioned the operative mortality is nil. The question only arises what we understand by an "early operation."

It is agreed to-day that, when we see the case within the first 24 hours and the relation of pulse, temperature and leucocytosis, as mentioned above, is present, the case should be operated on. If the case is seen later, on the second or third day, and the symptoms as well as the relation of pulse, temperature and leucocytosis are on the decline, we know that we are dealing with an acute catarrhal appendicitis, and we can wait for an interval operation. In case we find that the symptoms are aggravated and the relation between pulse, temperature and leucocytosis is an unequal one, for instance, the temperature may not be high, while the pulse becomes much more rapid and the leucocytes high, we know that suppuration is taking place and operation should not be delayed at all. At other times we find pulse rapid, temperature not much elevated, and leucocyte count low; it is usually a sign of low resistance, and the case is prognostically very grave.

In such cases it may be best to delay operation.

When the temperature, pulse and leucocytosis are all on the increase, a more wide-spread involvement of the peritoneum can well be suspected, and with the present state of surgical skill, operation should be performed during that stage. Operation should also be immediately performed where a palpable mass in the appendicular region is found.

Internal treatment is only limited to such cases where surgical aid cannot be obtained at once, or where operation is absolutely refused by the patient, or where some chronic constitutional disease absolutely contraindicates operation. In the internal treatment we cannot caution enough against the use of laxatives. They only tend to increase peristalsis and so cause great mechanical irritation and with it spreading of the disease. If evacuation is desirable at all, we should try to obtain such by one pint of a low S.S.; this clears the rectum from fecal matter without causing irritation. For the pain local application of an ice-bag is in most cases completely sufficient. Food should be completely withheld for at least 24 hours and limited to boiled water and weak tea.

Should there be any tendency to cardiac weakness, the addition of small quantities (teaspoonful 4 t.d.) of cognac may be allowed.

If the case improves after 24 hours, milk, half diluted with water or lime-water added to the milk, a tablespoonful to the wineglass. On the fourth day, prepared cereals in milk and toasted white bread with some butter may be allowed. Toward the end of the week we allow scraped beef, soft boiled eggs, cooked fruit and vegetable purée. In case of appendicular colic, appendicitis larvata (*Ewald*) or whenever a diagnosis of chronic appendicitis is made, surgical interference should be advised. In cases where operation is refused by the patient, or some constitutional disease contraindicates operation, internal treatment must be instituted. Our greatest aim in these cases is to overcome constipation, best accomplished by proper diet and the oil treatment (see p. 72). Priessnitz around the abdomen at bedtime. During the attacks belladonna suppos. (0.03) at bedtime are advocated.

ABNORMALITIES OF FORM AND POSITION OF THE INTESTINES.

Idiopathic dilatation of the colon (*Hirschsprung's* disease) is nearly always congenital, either as a result of the faulty development of the intestinal wall or faulty innervation. Many of these children suffer already from tympanitis in earliest childhood, from extreme and obstinate constipation and the feeling of fecal masses in the descending colon, chiefly also in the region of the flexures. The patients (children) have a sallow expression, usually lose in weight, and are even mentally undeveloped. In adults, cases are also met with where dilatation of the colon is the result of obstinate constipation and meteorism.

Treatment.—Electricity, massage, hypodermatic injections of strychnin, olive oil enemata, high colonic irrigations; wearing of flannel binders. If medicinal treatment is not successful, surgical interference may become indicated.

Intestinal Diverticula.—Mostly congenital as a result of a persistent Vitellin duct, or else acquired.

The congenital diverticulum consists of all the layers of the intestines, the acquired of the mucosa and serosa only.

If the diverticulum is closed toward the intestinal lumen, cystic dilatation will occur, and we then speak of enterocystoma.

In rare instances the diverticulum establishes a communication between the ileum and the external abdominal surface, terminating in an opening at the umbilicus, through which the intestinal contents find an outlet.

The symptoms are those of intestinal obstruction.

FUNCTIONAL NEUROSES

Intestinal neuroses are divided into (1) motor disturbances, (2) sensory disturbances, and (3) secretory disturbances.

a.—Motor Neuroses

Nervous Diarrhea.—On account of increased peristalsis, diarrhea without any underlying anatomical changes in the gastro-intestinal tract may occur.

The diagnosis is based upon the absence of mucus and blood in the stools, upon the fact that the diarrhea is entirely independent of diet, and that there are other nervous phenomena associated with it, and that there are liable to be periods of relief, although the patient partakes of the coarsest articles of food; we will often find the diarrhea the result of mental or physical overwork and as a result of anxiety.

Treatment should be directed against the cause of the disease; chiefly to strengthen the nervous system. Hydrotherapeutics, arsenic hypodermatically, bromides, change of climate, are beneficial.

Enterospasm is a nervous condition of the intestines, when there is a prolonged spastic contraction of the musculature of the intestine, causing a narrowing of the lumen. The contraction may involve only part of the intestinal tract or the entire intestines in meningitis, lead-poisoning and other diseases of the pons and medulla, the sunken-in abdomen is the manifestation of spasm of the whole intestines; much more frequent is a circumscribed enterospasm; on inspection an asymmetric retraction of that part of the abdomen is noticed.

The most important symptom is the obstinate constipation. There may be no movement for days, and when one occurs, it is usually accompanied by pain, and the feces have a pencil or ribbon shape, also the sheep feces, as in spastic constipation. A less constant symptom is the pain; more commonly there is discomfort and a sensation of

tightness in the abdomen. The spasm is liable to last for hours or even weeks, without causing meteorism.

The condition is not a frequent one; if it is persistent, anatomical changes will occur in the colon on account of the stagnated feces, and the condition becomes characterized by mucus in the stools.

Often another nervous condition is observed, due to spasm of the intestines where the chief symptom lies, the patient feeling the intestines distended with gas, although objectively there is no marked meteorism.

The relief usually comes with expulsion of gas per rectum and eructation by mouth (flatulentia nervosa).

Treatment.—Warm applications or Priessnitz compresses, warm bath; enemas of camomile or peppermint tea, belladonna in the form of suppositories (0.02 or 0.03) is useful. The most efficient is the oil treatment by enema (see p. 72).

Diet and general hygienic measures are chiefly directed to the improvement of the nervous condition.

Peristaltic Unrest (tormina intestinorum).—Patients complain of a sensation of tightness in the abdomen, accompanied by rumbling sounds (borborygmus) without any anatomical changes in the intestines to account for it.

Digestion is usually not disturbed, although at times there is some regurgitation and nausea.

The condition is exclusively located in the small intestine.

Treatment should be directed to soothe the nervous system by hydrotherapy, electricity, change of climate. Constipation should be overcome by diet or oil enemata. Valerian, bromides are useful; arsenic and strychnin may do good.

Antiperistalsis.—Under very rare circumstances, particularly in hysterics, such a marked degree of antiperistalsis takes place without any anatomical basis that it even leads to fecal vomiting.

Diagnosis should first exclude ileus, gastro-intestinal fistula, take into consideration that the bowels move regularly and the general condition is fair, and that the periods of antiperistalsis depend upon psychic influences.

Treatment is chiefly directed to the cure of the nervous condition.

Proctospasm.—Without any anatomic lesion proctospasm is an extremely rare affection, as it is usually found as a result of fissura

ani, rectal crises of tabes, disease of uterus and adnexa. Sometimes disease higher up in the colon gives rise to reflex spasm of the anus, or as a part of general enterospasm; but the condition we have reference to has no underlying cause, except pure neurosis.

The patient has usually severe pain in the anal region; defecation is impossible. Examination of the rectum cannot be made without anesthesia. The condition may last from a few minutes to 2 to 3 days.

Treatment.—Application of heat; hot sitz baths; cocain and belladonna suppositories (āā 0.02); sometimes morphin injections have to be resorted to; in other cases forcible dilatation of the sphincter under anesthesia becomes necessary.

Nervous Paralysis of the Intestines.—At times a condition is met with in nervous people, where there is meteorism, absolute constipation, vomiting of even fecal matter, simulating ileus without any anatomical lesion.

The general condition of the patient is entirely out of proportion to the severity of the symptoms. It occurs at intervals, not necessarily preceded by constipation.

Treatment.—High enemas, turpentine stupes; if vomiting persists, stomach lavage should be immediately resorted to. Bromides and valerian are also effective.

Paralysis of the Sphincter.—Organically, proctitis, hemorrhoids, general weakness of the muscular apparatus, disease of the bladder and urethra, also torn perineum on account of labor, disease of the central nervous system, are the causes; but sometimes no underlying cause is found: it is purely neurotic. In such cases it is impossible to control the passing of stool, at times there is even a continuous flow of feces.

Treatment.—Local injections of strychnin (0.001); timely evacuation of the bowels by enemata, electricity, massage and general toning up of the system.

b. Sensory Disturbances of the Intestines

Enteralgia.—To this class belong the cases where there are attacks of severe intestinal pains without anatomic lesion in the abdominal organs, either purely neurotic (hysteria, neurasthenia) or as a result of tabes dorsalis (intestinal crises) or of lead-poisoning (produced by the spasm), also gout and malaria.

Diagnosis is extremely difficult; adhesions and strangulation of internal herniæ must be excluded.

Treatment is purely symptomatic.

Hyper-para-anesthesia of the Intestines.—In hysteric and neurasthenic patients there is not infrequently a sensation of tightness in the intestines, of burning, distention immediately after meals or hours later, also before or after evacuating the bowels without any underlying anatomic lesion. Neurogenic hyperesthesia is most commonly met with in the rectum and anus.

Upon examination local diseases of the rectum and anus can be excluded, also diseases of the higher portion of the colon and pressure from the neighboring organs: and still the patient has tenesmus, a sensation of foreign body in the rectum and tickling around the anus. At times, evacuation is associated with sexual gratification, particularly in sexual neurasthenics. There may also be a sensation of tired feeling, nausea and chilliness.

Anesthesia in the higher portion of the intestines cannot be diagnosticated, but anesthesia of anus and rectum, without any central or local lesion, are met with.

The condition is characterized by the patient losing any and all feeling in the rectum. Feces can lodge there in considerable quantities without patient feeling the desire of evacuation. This is sometimes liable to lead to such an accumulation that we have to remove the feces with the fingers.

The treatment of these conditions must first be directed toward building up the nervous system.

Locally, warm sitz baths, hot and cold douches interchangeably to the rectum, galvanic electricity; anode in the rectum, cathode over the lumbar region.

If the pain is very severe, local applications to the rectum of anesthesin, cocain either as salves or suppositories should be made, or bismut. subnitrate applied as follows:

8 or 10 gm to 150 gm of water through a funnel and rectal tube are allowed to flow into the rectum, then we let the water flow off and the bismuth remain on the mucous membrane.

If, owing to the anesthesia there is involuntary passage of feces, evacuation should be accomplished by low saline enemas and an apparatus, such as is used for prolapsus recti, applied, held by a T-bandage.

c. Secretory Neuroses

Sometimes there is a continuous secretion in the rectum, wetting the anus constantly and giving rise to burning and itching at the anus. At times, considerable fluid, thin and white in character, is seen to flow off in such patients. This condition is also common in sexual neurasthenics.

Treatment, aside from treating the underlying nervous condition, is local with dermatol, aristol or injections of bismuth, as mentioned above; cold sitz baths, douches and galvanic electricity may prove useful.

Colica mucosa is another secretory neurosis. Like enteritis membranacea, it gives rise to colicky pains in the abdomen, expulsion of large quantities of mucus with and without the feces, also a sensation of tightness in the abdomen, and at times meteorism. But there is no pathologic lesion in the intestines: it is purely a nervous hypersecretion.

Treatment.—Here the oil treatment by enema (see p. 72) is most effective. As to diet, *von Noorden* recommends to give these patients a diet rich in cellulose, so as to overcome the constipation usually accompanying this condition and thereby overcoming the hyperesthesia and the spasm; we are of the opinion, however, that these patients, while receiving a mixed but most substantial diet, should rather have the vegetable in purée form, leaving out the coarse vegetables.

Belladonna in the form of suppositories (0.03) is beneficial. Bromides and valerian, arsenic hypodermically in the form of cocadilate of soda, are effective. Hydrotherapeutics, change of climate, should be advised.

At times we meet mixed forms of intestinal neuroses, frequently presenting the following symptom complex:

At certain intervals the patient gets periodic attacks, lasting a few hours, of distention after meals, a feeling of burning and discomfort in the abdomen, the patient runs restlessly around and is sometimes relieved by expulsion of gas per rectum or by eructation.

Intestinal Dyspepsia as a Result of Idiosyncrasy (Anaphylaxis). —In some people, the partaking of certain articles of food, such as strawberries, fish, oysters, and in some even eggs, cause diarrhea,

nausea, vomiting, and skin manifestations like urticaria, erythema, localized edema of the skin. We now know that these conditions are analogous to the serum anaphylaxis, that is, that these people react to these articles of food abnormally.

Treatment.—Patients should avoid such articles of food that bring about the symptoms.

DISEASES OF THE INTESTINAL BLOOD-VESSELS

Embolism and thrombosis of the arteries constitute a rare disease, the most common cause of which are endocarditis and atheromatous changes of the aorta.

The superior mesenteric artery is the one most often occluded. As a result of the embolus, the intestines become congested and edematous, while numerous ulcers and erosions are found on the mucosa.

The symptoms may be those of intestinal obstruction, extreme colicky pain, meteorism, vomiting of first gastric contents, then of biliary, and finally of fecal masses; there are bloody stools, or blood is continuously running from the anus.

In other cases the symptoms of internal hemorrhage predominate: cold perspiration, rapid, thin, wiry pulse, shallow respiration, death-like pallor.

The *diagnosis* is based upon the underlying cause and the knowledge that patient was previously free from gastro-intestinal symptoms.

The *prognosis* is grave, death usually resulting in from 24 to 48 hours, although a few cases of recovery have been reported.

Treatment is purely symptomatic. The patient's strength is maintained by active stimulation, the pain is soothed by morphin. Application of ice-bag, when hemorrhage predominates, or hot turpentine stupes in case the meteorism is very distressing.

Ergotin and adrenalin by drops 1: 1000 hypodermatically and continuous *Murphy* drop method per rectum. The injection of human blood serum, intramuscularly, or *Merck's* gelatin should be tried.

Thrombosis of the mesenteric veins present the same picture as the mesenteric arteries.

Periarthritis Nodosa Intestinalis.—*Kussmaul* and *Meyer* describe

a disease, where colicky pains, tenesmus and diarrhea persist, the lesion being found in the arteries. It is mostly of syphilitic origin.

Amyloid Disease of the intestines and intestinal blood-vessels is usually the result of chronic wasting disease, diabetes, leucemia, tuberculosis—particularly bone tuberculosis—syphilis, chronic nephritis.

The *diagnosis* is difficult. Continuous diarrhea associated with one of the above-named diseases would awaken suspicion. Proctoscopic examination would show an extremely pale mucosa.

Prognosis is fatal.

Treatment is directed to the underlying cause.

Arteriosclerosis, simulating gastro-intestinal diseases.—We often find patients, especially those past middle age, who have severe periodic attacks of gastric or gastro-intestinal pains, sometimes associated with vomiting; they also have sensations of pressure in the epigastric region and are now becoming constipated, although they were previously normal. The lesion is an arteriosclerosis, with marked sclerotic changes in the coronary arteries and arteriosclerosis of the abdominal aorta.

The differential diagnosis from real gastro-intestinal diseases lies in the high blood pressure, muffled first sound at the apex, ringing second aortic sound, pallor, frequently presence of albumen in the urine and occasional granular and hyaline casts.

The head-zones of hypersensitive areas over the abdominal aorta or of the upper portion of the sternum corresponding to the thoracic aorta are usually present.

Treatment.—Reduce the meat diet, give exclusive lacto-vegetable diet for a week. Internally, diuretin (0.5), theocein (0.4), or iodites: sajodin (0.5) or natrii iodati (0.5) 3 times daily, or mild hydrotherapeutics, and avoidance of physical and psychical exertion.

PARASITES OF THE INTESTINAL CANAL

Animal parasites:

Cestodes (Tapeworm):

Tænia solium,

Tænia saginata,

Dio·bothriocephalus latus.

The tænia solium (Fig. 11) has a length of 2 to 3½ metres and, magnified 50 times, the head can well be seen.

The segments of the body, the proglottides, increase in length and breadth, the farther they are away from the head. The head has 4 suction disks.

The rostellum, or conelike projection, is on top of the head, surrounded by 20 hooks.

By means of the suction disks and the rostellum the mucous membrane is held tight, usually at the upper end of the ileum, the lower end being at the ileocecal valve.

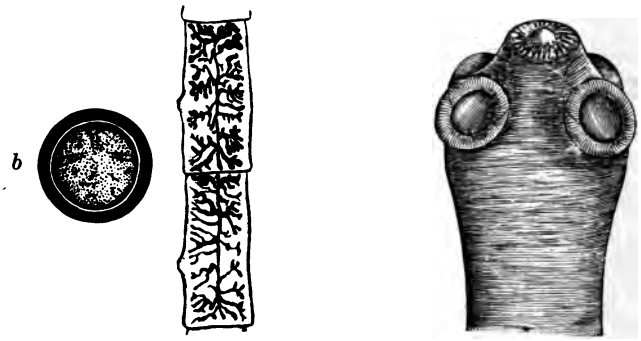

FIG. 11.—Tænia Solium. *a*, head; *b*, egg; *c*, proglottide.

The head, when left inside alone, is liable to regenerate the entire worm.

The last 80 to 100 proglottides possess the male and female sexual organs.

In the fertilized uterus, round or oval-shaped eggs are developed with a coarse shell; the eggs possess a scolex with six hooks. The tænia solium reach the human body with raw pork. The careful inspection of pork has very much reduced the frequency of tænia solium.

Tænia saginata (Fig. 12), 6 metres long, head 2½ mm with 4 powerful suction disks. The eggs are likewise oval, but the shell is not so very coarse. Infection occurs by raw beef.

Dio bothriocephalus latus (Fig. 13), is 8 metres long and has a suction disk on each side of its head. Infection occurs by salmon, pike, barbel, turbot, and trout.

Symptoms.—While with many patients the worms are discovered accidentally in the feces, others suffer from a vast host of symptoms. The general symptoms are loss of appetite, nausea, eructation, vomiting, disagreeable taste, and sometimes a feeling as if something were moving in the intestine.

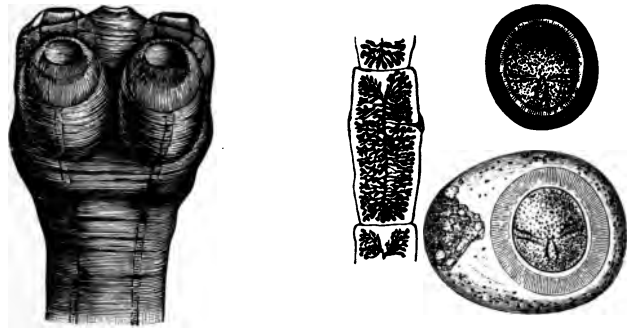

FIG. 12.—Tænia Saginata.

With other patients the appetite is excessive, but they always have a sensation of nausea and easily get dyspeptic symptoms, especially when they partake of spices. There may be constipation or

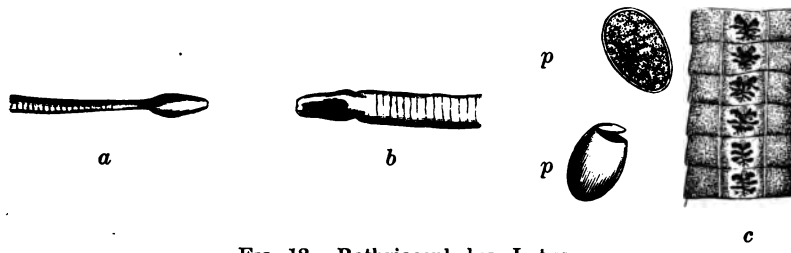

FIG. 13.—Bothriocephalus Latus.
a, b, head; *c,* proglottide; *d, d,* eggs.

diarrhea, or both, alternating. Some patients have a garlic taste in the mouth.

Nervous Symptoms.—Somnolence, headache, vertigo, dizziness, tremor; even convulsions may occur.

Sometimes the only symptom is constantly increasing anemia, which may lead to a blood picture corresponding to progressive pernicious anemia. According to *Grawitz*, this condition is due to the toxins of the dead worm in the intestine.

Diagnosis is chiefly based upon finding the ova and segments in the feces.

Treatment.—Prophylaxis consists in thorough meat inspection, also looking for the cysticerci. Farmers should not allow cattle and hogs to drink water contaminated with human excrements. Stables should be kept clean. Beef, ham and fish should be thoroughly cooked.

To remove the worm:

Preparatory treatment:

Liquid food and raw eggs for 24 hours.

Castor oil, a tablespoonful 3 times daily, or infusum Sennæ or a saline laxative.

Expulsion Cure:

The best drug is male fern, administered as follows:

Extract. filicis maris æther..... 10.0

Syrupus simplex 40.0

Entire dose to be taken in 10 minutes, to be followed 2 hours later by infusum sennæ 1 oz., or calomel 0.2 or 0.3; or the drug can be given in the form of Dietrich's remedy for adults and children.

Other remedies are:

Flores Kousso, 20 to 25 gr. in tablet form, or Cordicis radicis granati, 50 gr., to be macerated for 24 h. with 500 aqua, then evaporated to 250 and add syrup.

Sig.: To be taken in 2 portions.

Its active alkaloid, pelletiarin, 0.3 to 0.7 in 60 gm of water, may be used.

Kamalla 0.6 to 0.8 is prescribed by some.

If the head does not come out, treatment should be repeated within 3 months.

Hemmeter [2] reports a case where benzine gave good results after the other remedies had failed. It is given in the following manner: Castor oil by mouth, 30 gm; an enema of 1 qt water and 1 gm benzine. Three hours later the following mixture:

Benzine	6.0
Mucilage acacia, Syr. simplex āā.....	30.0
Aq. menthæ piperitæ	120.0

S. Tablespoonful every hour.

[2] "Diseases of the Intestines," 1902.

Treatment is contraindicated in pregnancy, hemorrhages in any part of the body, ulcer of any portion of the gastro-intestinal tract, tuberculosis, and wasting diseases.

Distoma Hepatica.—In 2 cases reported by *Virchow*, distoma hepatica was found in the bile-ducts. Patients did not show any symptoms during life.

Ascaris lumbricoides (Fig. 14), the long roundworm, nematode. The male measures 20 to 25 cm, the female 40 cm. At the end of the tail of the male is the cloaka with projecting copulative organs. The head is button-shaped, with 3 cone-shaped lips and about 200 teeth.

Numerous cross-striations and 4 longitudinal lines run from head

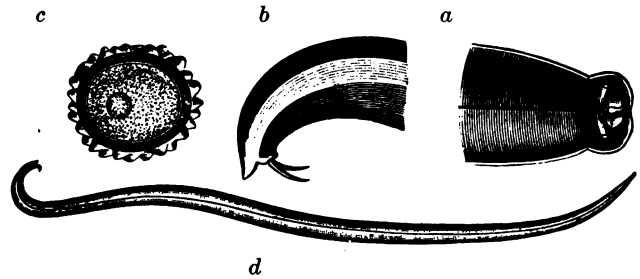

FIG. 14.—Ascaris Lumbricoides.

a, head; *b*, tail of the male; *c*, egg; *d*, male.

to tail. The 2 uteri are on the abdominal line of the female at the junction of the 1st and 2d third of the body.

The impregnated uterus has been estimated to contain about 60,000,000 eggs.

The worms are usually situated in the small intestines; sometimes they reach the stomach to be expelled by hemesis. They reach the body by the water, fruit and vegetables.

Symptoms.—Loss of appetite, offensive breath, salivation, bad taste in the mouth, and sometimes colicky pains. Usually there is constipation, rarely diarrhea. When the condition continues, anemia, with marked nervous symptoms, will develop.

Cases are mentioned where the worms have lodged in the esophagus, giving rise to esophageal obstruction. Other cases are cited where the larynx became obstructed, causing suffocation and death.

They frequently fill up the biliary passages, giving rise to jaundice. They are also found in the appendix.

The chief diagnostic feature is finding the ova or worms in the feces or vomitus.

Prophylaxis.—Thorough cleansing of vegetables and fruit.

Treatment.—For the expulsion, santonin, combined with calomel, is the most effective:

Calomel	0.04
Santonin	0.01

Dent. tal. dos. VI, one 3 times daily.

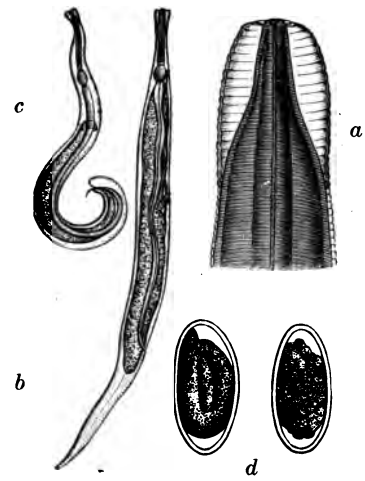

FIG. 15.—Oxyuris Vermicularis.

a, head; *b*, female; *c*, male; *d*, eggs.

Followed by a saline cathartic and no castor oil, and 1 or 2 low saline enemas during the treatment.

Should santonin cause poisoning symptoms, like yellow vision, twitchings, vomiting, the drug should be discontinued.

Oxyuris vermicularis (Fig. 15), (Pinworm, Seedworm). Thread-shaped parasite. The male is 5 mm long, the female, 12 mm. The mouth has 3 lips.

The oval eggs are always lodged outside of the intestines; hence eggs are never found in the feces. The parasites travel from the small intestines to the cecum.

The most important symptom is the severe itching of the anus, sometimes leading to onanism. The worms are often found on the bed-sheets in the morning.

Treatment.—Santonin is by far the best remedy. Benzine, 20 drops to the pint of water as a colonic irrigation. Thymol, salicylic acid and beta-naphthol may be used. For the itching, useful remedies are carbolic acid salve and mercury salve.

The irrigation treatment should be continued for 1 month.

Trichotrachelidæ (Whipworm). Fig. 16. Size of male, 40 mm,

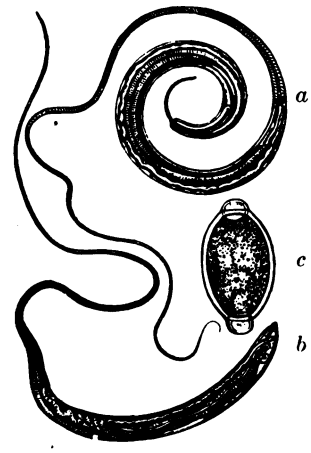

FIG. 16.—Trichocephalus Dispar. Whipworm.
a, male; *b*, female; *c*, egg.

of female, 50 mm. Oval eggs are usually seated in the cecum. The embryos get into the stomach by water, fruit and vegetables.

Symptom.—Diarrhea is the predominating symptom.

The *diagnostic* feature is the finding of the eggs and worms in the feces.

Treatment.—Internally, thymol 2 gm, 3 t.d., and benzine irrigations, 4 gm to a qt of water.

Trichina Spiralis (Trichinosis).—There are 3 stages of symptoms: Intestinal migration and encapsulation. Diagnosis during the first week is almost impossible, unless an epidemic prevails. During the second week, which is the second stage, bronchitis or even pneumonia may develop and then comes the 3d, the gastro-intestinal stage,

where the symptoms with the characteristic muscle symptoms, severe muscular pains and cramps, develop.

The *diagnosis* is based upon examination of the feces or excising a piece of muscle to be examined for trichinæ.

Prophylaxis.—Pork should only be eaten cooked.

Treatment.—Internal, gastric and colonic lavage; calomel and ipecac, naphthalin (0.3, 3 t.d.), resorcin (0.3), thymol (2.0) may be used. Benzidine irrigation. Nutritious and easily digestible diet.

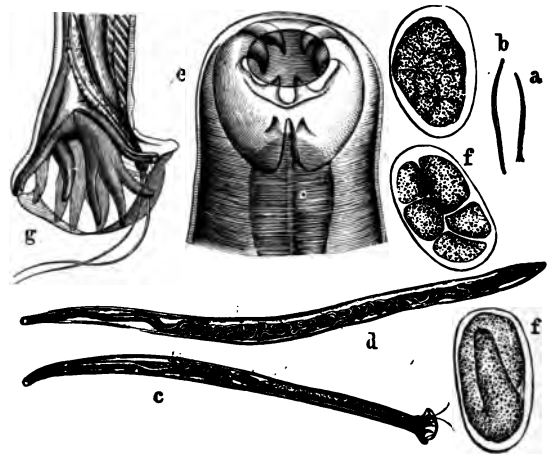

FIG. 17.—Anchylostoma Duodenale. Hookworm.

a, male; b, female (natural size); c, male; d, female (enlarged by magnifying glass); e, head; f, eggs; g, tail of male.

Uncinaria Duodenalis (Hookworm), Anchylostoma Duodenalis.—The male is 8 mm and the female 10 to 12 mm long. Under high power a bell-shaped mouth capsule is seen at the cephalic end with 2 teeth. With the strips of cliton it pierces the mucous membrane. Fecundity is about 5 months. The eggs have a bright shell, the contents of which are brownish. They are carried by the excrements of the person harboring the worm. The hookworm was first observed in Italy; at the present time it is also found in India, Germany and the United States, mostly in miners and bricklayers.

At the beginning the symptoms are gastro-intestinal. Oppression and fulness in the epigastrium, loss of appetite, nausea and vomiting, meteorism and constipation. Later the anemic symptoms make their

appearance. Weakness, loss of weight, pallor, hemic murmur. The stools show blood and the pathognomonic *Charcot-Leyden* crystals; also ova and, if an antihelmintic has been given, the parasites are found. The *Charcot-Leyden* crystals are such a characteristic feature of the disease that, when treatment is given to expel the worm and neither parasites nor ova are found any more in the stools, and the general condition is even markedly improved, the *Charcot-Leyden* crystals will tell us that the worm is still there and the symptoms will return.

The blood picture during the anemic stage is that of progressive pernicious anemia: marked reduction in red blood cells, high color

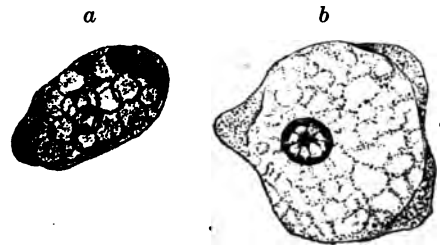

FIG. 18.—Amebæ Coli.
a, after *Roemer; b*, after *Doflein.*

index, slight leucocytosis, marked poicylocytosis, micro- and macrocytes as well as megaloblasts and microblasts.

In this connection it may be pointed out that the fact of finding eosinophilia in the blood should always awaken suspicion of a parasitic disease.

Prophylaxis.—Isolation of those suffering from the disease; destruction of their excrements. Water and eating utensils used by bricklayers and miners should be very clean; also they themselves should keep scrupulously clean. After the work, change their clothes and take a bath.

Medical Treatment.—Extractum filicis maris æther, in the same method as outlined for the tapeworm.

The other part of the treatment is chiefly symptomatic. The ***prognosis*** is favorable if the disease is attacked early in its course.

Protozoa.—Here belong the dysenteric and amebæ coli. They

are spherical, when at rest; 0.02 in diameter; with a nucleus and a nucleolus. Pseudopedes for locomotion.

It is common in dogs and cats. The clinical description is discussed in another chapter (see p. 211).

The greatest clinical importance among the *Infusoria* is commanded by the Cercomona intestinalis which, when present, gives rise

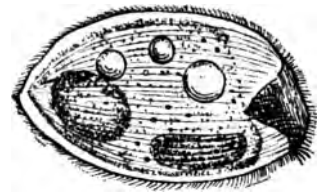

Fig. 19.—Balantidium Coli.

to a cadaverous odor of the patient. It was found in patients that suffered from Asiatic cholera.

Balantidium Coli.—Found in swine, principally in Norway, Sweden, Italy. Length, 0.07 to 0.1 mm.

Symptoms.—Chiefly diarrhea.

Treatment consists of tannic acid injections, 5: 1000, or chinin injections, 1 to 2: 5000.

Trichomonas Intestinalis.—Almond-shaped. Ciliary edge with a tail. *Leyden* found them in a few cases of chronic diarrhea.

CHAPTER IX

The Duodenum

The Duodenal Tube and Its Uses

HISTORICAL PART

Successful attempts at reaching the small intestine of man were made as far back as 15 years ago by *John C. Hemmeter*, of Baltimore.[1] *Kuhn* [2] with his spiral sound and *Glaessner* [3] have worked in the same direction. It was due to the methods adopted that the otherwise valuable investigations on the part of these authors were destined to suffer an early interruption. Not until *Pawlow* [4] experimented on dogs provided with an artificial gastric fistula, was the real foundation laid upon which further investigations in this direction could be proceeded with.

These experiments were continued and partly improved upon by others, notably *L. Tobler* [5] and *O. Cohnheim*,[6] *London*.

The classical X-ray examinations of animals by *Cannon*,[7] of Boston, should also be mentioned.

In quite recent times, *Holzknecht* and his disciples, and in this country *Pfahler* and *Skinner* (Kansas City), contributed to our knowledge of the human small intestine by means of X-ray examinations.

Of course, experiments made and experience gained with fistulated dogs cannot be at once applied to the human being. It was

[1] Johns Hopkins Medical Bulletin, April, 1895; Achiv für Verdauungskrankheiten, 1896.
[2] Archiv f. Verdauungskrankh., 1898.
[3] Hoppe-Seiler's Zeitschrift f. Physiol. Chemie, 1903, Vols. 36 and 40.
[4] Ergebnisse der Physiologie, 1902.
[5] Zeitsch. f. Physiolog. Chemie, 1905, Vol. 45.
[6] Die Physiologie der Verdauung.
[7] The Mechanical Factor of Digestion, 1911.

therefore a step in the right direction, an advance as yet incalculable in consequence and value, when an instrument was devised by us by which the human small intestine could be reached directly.

As far back as May, 1909,[8] our first successful attempts at reaching the human duodenum by means of the "Duodenal Tube" were made. The first publications on this subject appeared in the New York Medical Journal for February 8, 1910, in the Journal of the American Medical Association for April 23, 1910, and in the Münchner medizinische Wochenschrift, 1910, No. 22.

In November, 1909, *Einhorn*, of New York, demonstrated in the Clinical Society of the German Hospital his "Duodenal Pump," as he called it—an instrument resembling the duodenal tube in principle, but differing from it in some respects in regard to construction and method of application.[9]

It is admitted that only a mixture and not an isolated intestinal secretion can, as a rule, be obtained with the duodenal tube; likewise, that the duodenal tube does not furnish an ideal reproduction of what is going on in the intestinal tract; nevertheless, it may be confidently asserted that our method, owing to its simplicity and positive results, supersedes all indirect methods which often furnish indistinct and doubtful results, in elucidating the physiological and pathological occurrences in the human small intestine.

ANATOMY

Fig. 20 speaks for itself, but a few facts concerning the position and size of the duodenum will be in order.

The duodenum is the shortest and widest portion of the small intestine and is situated deeper than all the other parts of the intestinal canal.

It is not quite 25 cm long and is divided into an upper horizontal, descending and lower horizontal part. Its diameter is 2 to 3 cm, except at the pyloric ring where it is a little less. The direction of the upper horizontal part is from left inferior to right posterior. The descending part embraces the head of the pancreas in the shape of a semicircle and at its concave side and near the transition into

[8] Outdoor Dept., Roosevelt Hospital, Dr. Lyle.
[9] Duodenal Pump, N. Y. Med. Record, Jan. 15, 1910.

the lower horizontal part receives the common duct of the pancreas and liver.

The lower horizontal part rests on the third lumbar vertebra and is the most firmly fixed part of the duodenum.

In the upper horizontal part of the duodenum there are fine horizontal folds; in the other parts of the duodenum the folds are

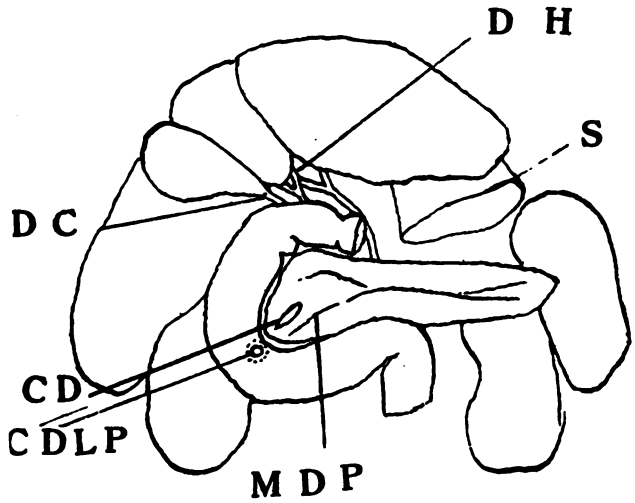

FIG. 20.—Duodenum in Relation to Other Organs.

DH, Ductus Hysaticus; S, Stomach; MDP, Main Duct of Pancreas; CDLP, Common Duct of Liver and Pancreas; CD, Common Duct; DC, Ductus Cystocus.

more marked and circular, valvulæ Virsungii, and between the folds there are the so-called villi intestinales.

These villi and the entire mucosa of the small intestine are invested with an epithelium which belongs to the cylindrical variety and consists of cylindrical and goblet cells.

The glandular apparatus of this portion of the intestines consists of *Brunner's* glands, which are found exclusively in the duodenum, and *Lieberkühn's* glands which are found in all parts of the small intestine.

The transition part, from the duodenum to the jejunum, forms an annular eminence by means of a somewhat stronger musculature, resembling a kind of sphincter, the so-called sphincter duodeno-jeju-

nalis. This part is attached to the posterior region of the stomach by a kind of suspensory muscle.

Another important point is this, that the duodenum in the region of the papillæ Vateri is attached to the fatty capsule of the right kidney by fibrous layers, so that a descending right kidney may draw the duodenum down, causing it to kink (*Longyear*).

Another kind of kinking may be occasioned by traction at the transition from the duodenum to the jejunum, this part being fixed and the small intestine descended (enteroptosis) (*Lane*).

INSTRUMENT

Description of the "Duodenal Tube."—The "duodenal tube" (see Fig. 21) consists of a rubber tube which is not easily collapsible and has a diameter of 7 mm. It should be at least 150 cm long

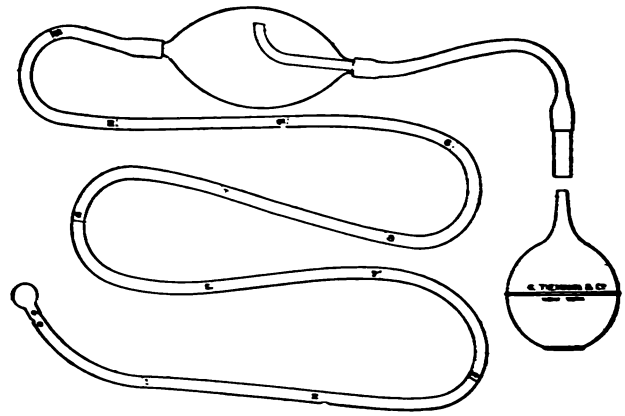

Fig. 21.—Duodenal Tube.

and is marked in divisions of 10 cm each. At the distal end there is a small, hollow, highly silverplated, multiperforated leaden ball of 13 mm diameter and 10 to 11 grams in weight, which is covered by the tube on all sides. A glass receptacle is attached to the proximal end of the tube. There is also a mouthpiece, through which we aspirate ourselves and which connects with the receptacle by a small glass tube. If desired, a rubber bulb may be attached for purposes of aspiration.

The instrument can easily be cleansed. It is really nothing else but the soft stomach tube devised by us and described in the Therapeutische Monatshefte for 1894, except that it has been suitably changed by elongating and weighting it.

Insertion of the Duodenal Tube.—The following main points are to be observed in inserting the duodenal tube:

(1) The patient, in a sitting posture, swallows the metal ball with tube down to mark 45 cm, which is about 5 cm beyond the cardia.

(2) Patient assumes the right decubitus, which will cause the small ball to fall toward the pylorus, drawing the tube with it.

(3) We aid this process by gently pushing the tube in until mark 75 cm has been reached, or about 10 cm beyond the pylorus. At this point the patient is instructed to slightly bite on the tube, thereby fixing it in this position.

(4) Aspiration is made ½ to ¾ of an hour later.

Detailed Description.—Patient assumes a comfortable position in an armchair, the head slightly inclined backward, so as to let the ball fall back toward the posterior pharyngeal wall.

The patient having well moistened the ball with his saliva, is told to swallow it as he would a pill. As soon as the ball has arrived at the posterior faucial wall, the patient is energetically requested to swallow a few times. At the same time we rapidly push the tube in, in order to facilitate the ball gliding down. It is important that the patient's act of swallowing and the act of pushing in the tube be executed simultaneously, as otherwise the ball will be returned again and again by retching.

With this manipulation there is no need for the patient to wash the ball down with a drink of water. We have always been able to dispense with water.

Slight cyanosis, due to spasm at the entrance to the larynx, is quickly overcome. Once the narrow place passed, there is no further obstacle to the advance of the tube.

When the tube has been swallowed down to mark 45 cm, we convince ourselves of the unimpeded passage by lightly blowing into the tube. Should there be an obstruction, caused by kinking, it is rapidly overcome by slightly withdrawing the tube.

As soon as patient has assumed the right decubitus, the tube is

gently pushed forward, rather following the traction of the ball. The tube is allowed to glide in to mark 70 cm (about 10 cm beyond the pyloric ring), in order to have a sufficient length of tube hang in the gastric cavity, enabling the ball to work its way onward (see Fig. 22).

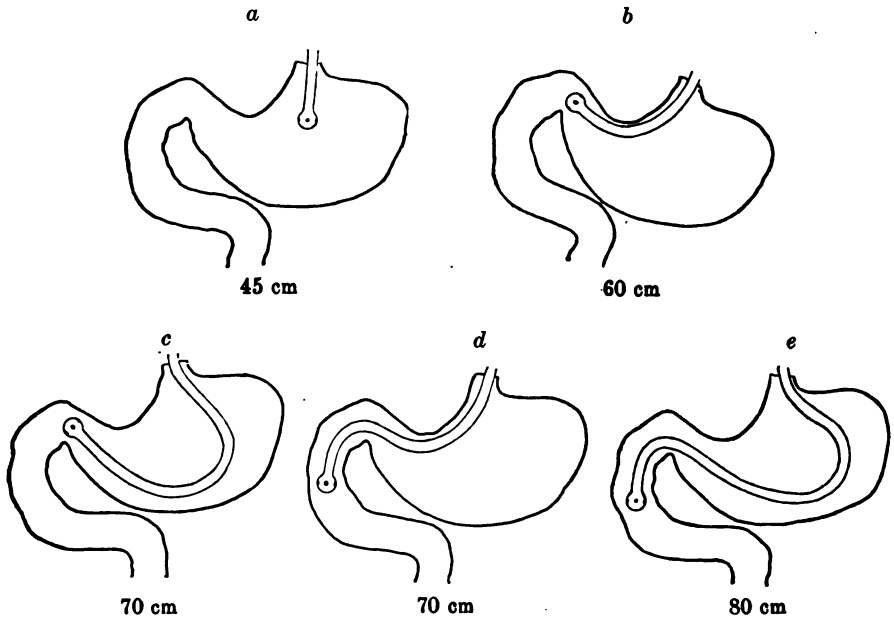

FIG. 22.—Schematic Drawing of the Stomach and Duodenum, showing the Little Ball of the Duodenal Tube during Introduction.

The numbers correspond to the marking read off at the outer end of the tube. At *a*, patient is sitting. At *b*, *c*, *d*, and *e*, patient lying down on his right side.

At this juncture patient is instructed to hold the tube in position by slightly biting upon it for ½ to ¾ of an hour, in fact, long enough to allow the ball to enter the duodenum. Pushing the tube still farther in before this time has elapsed would simply cause it to roll up in the stomach, frustrating the entire procedure.

During this time the patient usually falls asleep, while the physician may attend to other duties. When the ½ to ¾ of an hour has expired, the contents are aspirated from time to time until characteristic duodenal juice appears in the receptacle, which is usually the case after ½ hour to an hour.

This our method of introducing the apparatus entirely circumvents the fundus action of the stomach, as it brings the little ball at once to that part of the stomach—the pars pylorica—which alone is concerned in the propulsion of its contents.

Fig. 23.—Skiagram Showing Tube in the Duodenum.

"*Deep Exploration.*"—As soon as the tube is positively lodged in the duodenum, it may be inserted deeper, with the patient in a lying or sitting posture, following the same principle as above described, by slightly advancing the tube by 5 cm every 5 to 10 minutes.

Deep introduction of the "intestinal tube" renders it desirable to use the fluoroscope in order to control the position of the ball.

FIG. 24.—Skiagram, Showing Tube in the Duodenum; Bismuth Used, Showing Outline of Stomach.

We have so far succeeded in advancing the tube to 250 cm, but there is no reason why greater depths should not be reached. This would, of course, require longer time under fluoroscopic control. Skiagrams, Fig. 23, Fig. 24, Fig. 25, show the duodenal tube in the intestine.

Physiological Remarks.—The small intestine, which is about 17 to 20 feet long, is in tonic contraction when empty. Judging by experimental observations on animals by *Cannon*, our little ball, after having passed the duodenum and reached the jejunum, exerts a local irritation upon the intestinal mucosa, through which the intestinal

Fig. 25.—Skiagram Showing the Duodenal Tube Within the Intestine Away Down.

portion above the place of irritation will be brought into a state of tonic contraction, while the portion below the place of irritation will become relapsed for a considerable distance. The consequence is that the little ball, like a foreign body, will be propelled through the constricting ring in the direction toward the anus.

This makes it intelligible why it is necessary to help the tube

from time to time by gentle pushing, so as to give the ball free play to make headway. The deeper we get, the slower will be the progress of the tube, because the intensity of motion of the small intestine decreases from above downward. However, there will always be continuous progress, since, according to *Mall's* (Baltimore) incontrovertible investigations, there is no antiperistalsis in the small, as there is in the large intestine.

"*Test Meal.*"—In order to study the secretory conditions of the small intestine, it is advisable, as we have pointed out first, to administer some test meal (milk half diluted with water) ½ hour before introducing the duodenal tube.

In order to shorten the entire procedure, we introduce the tube upon a fasting stomach, and after it has been located in the small intestine, let the patient take some fluid food per os, not through the tube, which enables us to catch the chyme by aspiration on its way through the intestine.

APPEARANCE AND REACTION OF ASPIRATED INTESTINAL JUICE (DUODENUM, JEJUNUM)

As long as the small ball is still in the empty stomach, the gastric juice, which is secreted by direct irritation of the ball on the mucous membrane, has a watery, clear appearance, is slightly viscid and permeated by minute mucous flocculi.

Owing to regurgitation of duodenal contents the aspirated juice may have a greenish-yellow discoloration and thereby simulate duodenal juice. However, the watery appearance, and especially the pronounced acid reaction, protect against error.

As soon as the little ball has reached the pars pylorica of the stomach, the secretion becomes somewhat thicker, is gray or light yellow in color and nearly always of neutral, less often of weakly acid reaction.

Insufflation of air through the tube at this juncture is difficult or for a time impossible, owing to the small ball being embraced from all sides by pyloric musculature. The picture, however, is changed instantly as soon as the ball has passed over the pyloric ring and reached the first part of the duodenum (pars horizontalis superior

duodeni), which is also called the second stomach on account of the anatomical conditions of the stomach being still present in that part of the duodenum.

The acid gastric juice here comes in contact for the first time with the alkaline duodenal juice, and it is here that the acid gastric juice is neutralized, while the pylorus is closed.

The juice aspirated from this part has an ochre- or yolk-yellow color, is turbid, and the reaction is still distinctly acid.

The turbidity corresponds to the effervescence which occurs when HCl is added to the intestinal juice in the test-tube (own observation). The same phenomenon will take place if $\frac{1}{10}$ normal HCl is introduced direct into the duodenum, causing the duodenal juice to become suddenly turbid and ochre-yellow, after it had been clear a moment before. The same phenomenon again takes place, when a wave of acid gastric juice is squirted into the duodenum. The explanation is that as soon as gastric juice meets with duodenal juice, which contains sodium carbonate, carbonic acid is set free. According to *Bunge*, this development of carbonic acid is supposed to mechanically rend asunder the smallest food particles, to loosen the chyme and thereby give the intestinal ferments still freer access to all parts of the chyme.

After a time, however, the contents gradually clear up and assume a green, golden-yellow color with a greenish fluorescence: characteristic duodenal juice. Gradually also the reaction changes from acid to weakly acid, neutral or alkaline.

In some rare cases, when the ball is in the vicinity of the papillæ Vateri or a little lower down, it may be possible to obtain pure duodenal juice, mixed with gall-bladder contents. In this case the fluid is dark, sometimes dark brown, and more viscid. In a case of a considerably enlarged, dropsical gall-bladder we were able, by exerting pressure from without, to squeeze out large quantities of viscid, dark gray gall-bladder contents, mixed with duodenal juice, and to collect the same in the receptacle.

The conditions of reaction and the appearance of the juice, such as prevail in the duodenum, continue for a short distance (about 120 cm in the jejunum).

At a still greater depth, at about 150 to 200 cm, the contents of the small intestine become light wine yellow and more viscid (jejunal

juice). The reaction of the pure jejunal juice is weakly acid, occasionally alkaline.

All this refers to the empty gastro-intestinal tract. As soon, however, as food is administered, the conditions of reaction change. On giving patient milk, half diluted with water, to drink, with the duodenal tube in the jejunum to about 150 cm, we observe the following: As early as 10 seconds afterward, at a time therefore when the milk was still in the stomach, we obtained a kind of "advance wave" of apparently duodenal juice. After a further 10 seconds, there is the first unchanged milk-wave to be observed in the receptacle. The greater part of the milk apparently passed through the so-called *Retzius* semi-grooves along the lesser curvature of the stomach, toward the antrum pylori, whence it was rapidly propelled into the intestine. After about half an hour the influx of pure milk decreased and the aspirated juice rather assumed the character of pure jejunal juice and had a distinct acid reaction.

The experiment being terminated, the tube is now carefully withdrawn, during which procedure there reappears at a depth of about 110 cm distinct duodenal juice of a golden-yellow color and alkaline reaction. Arrived back in the stomach, only traces of milk are found of greenish-yellow discoloration and pronounced acid reaction.

In a number of other cases the experiment was made with bouillon, strained barley soup and water, and the findings were similar to those made with the milk.

Ferment examinations in 30 different patients [10] were made according to the methods described by us,[11] with the result that amylopsin (the starch-splitting ferment) and steapsin (the fat-splitting ferment) were never absent in fresh duodenal juice; the average values for trypsin (the protein-splitting ferment) were between distinct and weak, and were completely absent only in 4 cases.

The method used was:

Amylopsin.—A liberal quantity of a 1 per cent. aqueous solution of Kahlbaum's soluble starch is heated in the incubator to 55° C., also a number of empty test-tubes. Five cc of this heated solution is put into the heated test-tube, four drops of duodenal juice are added, the tube being shaken vigorously for a minute. Thereupon

[10] Wiener klin. Wochensch., 1910, No. 32. [11] Medical Record, 1910, No. 12.

½ cc of a 250th normal iodine solution is added as above described. (*a*) If no amylopsin is present, the solution will become sky-blue, or green when gall is present; if traces are present, it will turn blue-violet; if large traces are present, it will turn red-violet; if the quantity is normal, it will turn pale pink, and if there is an excess, it will be colorless. (*b*) If, to this solution a sufficient quantity of Fehling's alkaline be added, it will always become colorless. Upon a further addition of Fehling's copper and subsequent boiling, it can be demonstrated whether the starch digestion has at least partly taken place up to the point of sugar formation.

Steapsin.—Some fresh butter is melted and the clear, pure fat abstracted. This is mixed with a little 0.1 per cent. aqueous potassium carbonate solution and phenolphthalein, then shaken and titrated with liquor sodæ until there remains a distinct red coloration. This solution is likewise heated in the incubator to 55° C. and 5 cc of the same is shaken with 5 drops of intestinal juice in a heated test-tube. If there are normal quantities of steapsin, the red color will disappear in from 2 to 5 minutes. According to the rapidity of this decoloration, the quantity of active steapsin can be estimated.

Trypsin.—A solution of 0.07 per cent. copper sulphate and 0.1 per cent. sodium carbonate is mixed with a few drops of Fehling's alkaline and ½ per thousand of casein. This solution is heated in the incubator at 55° C. In a heated test-tube again 5 cc are shaken up with 5 drops. At first the color is distinctly blue or, if there is gall present, it will turn green. Dependent upon the quantity of trypsin present, this color will become more or less red-violet or, after a few minutes, even pink.

For the practical purposes of clinical investigation it will be sufficient to examine duodenal juice by means of the methods above described, these being much more complete than the clinical routine examinations of the gastric juice.

Fat digestion occurs first, then proteid digestion and finally carbohydrate digestion.

The average specific gravity of the duodenal contents was 1.006, that of the small intestine slightly above 1.007.

DIAGNOSTIC PART

The duodenal tube can be used diagnostically to determine the permeability of the pylorus.[12]

According to *Sahli*, the permeability of the pylorus is established if a small cork ball, 1 cm in diameter, can pass through it. If, therefore, the small ball of the duodenal tube, which slightly exceeds the diameter of 1 cm, passes through the pylorus without difficulty, it follows that in spite of any possible clinical manifestations of stenosis, there can be no serious mechanical obstacles (kinking). On the other hand, the presence of a serious obstruction must be assumed if the little ball is unable to pass the pylorus in spite of repeated attempts (cicatrization after ulcer, hypertrophic stenosis, adhesions). If, however, the ball should pass the pyloric ring after a few futile attempts, we may have to deal with a pure pylorospasm (cholelithiasis, appendicitis, hyperchlorhydria, ulcus ventriculi or duodeni, intestinal parasites and chronic obstipation with anatomic disturbances) or there may be an organic stenosis of light degree with complicating spasm of the pyloric muscle.

In one of our cases of benign stenosis of the pylorus we succeeded by therapeutic measures (lavage of the stomach, diet, bandage, etc.) in making the previously resisting pylorus passable for our little ball, the result of our treatment being the removal of the complicating pylorospasm.

The duodenal tube may also be utilized in diagnosing duodenal ulcer.* We have observed small, macroscopically visible specks of blood floating on the aspirated duodenal contents in a number of cases which presented the clinical signs of duodenal ulcer. As they were not present in our numerous other observations, we are justified in attributing a diagnostic significance to this finding. Absence of the specks in suspected ulcer cases would not exclude ulcer.

As the duodenal contents are discolored by bile, the usual method of blood examination as to whether the specks are blood or not are not

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[12] See also article on the same subject in the N. Y. Medical Journal of August 26, 1911.

* N. Y. Medical Record, 1911.

available owing to the uncertain color reaction. In such cases we apply the microchemical method (*Teichmann's* hemin crystals).

One drop of the following solution:

Acidi formici (spec. grav. 1.2)	4.0
Hydrobromic acid (34%)	gtt. i

is added to the suspected blood speck on the slide. This is covered by an hour-glass just the width of the slide and then gently heated till evaporation begins.

As the hemin crystals used in this method are very small, an immersion lens must be used.

Disturbances of Motility of the Duodenum.—Motility disorders of the duodenum are by no means as rare as might be imagined. *Holzknecht* [13] was one of the first to call attention to these disturbances, caused by stenosis, which he had observed by means of the X-ray. *Skinner*, of Kansas City,[14] has likewise made examination in this direction. He introduced bismuth direct into the duodenum

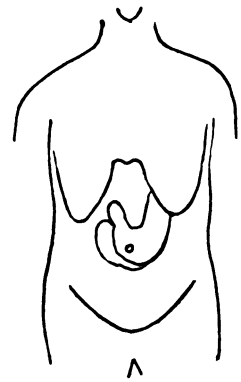

FIG. 26.—Showing the Insufflated Dilated Duodenum.

by means of the "duodenal tube," and made fluoroscopic observations on the motor disturbances of the duodenum.

We succeeded in a few patients with thin abdominal walls to insufflate the duodenum by means of the duodenal tube, thereby rendering the prolapsed and distended duodenum visible (Fig. 26). For

[13] Zentralbl. f. Physiolog., Vol. 23, No. 26.
[14] Arch. f. internat. Medizin, 1912.

the purpose of insufflating the duodenum, the "duodenal tube" is inserted deep into the duodenum, and a few short insufflations are made, which have the effect of causing reflex closure of the pylorus, thereby preventing escape of air into the stomach, and increasing the visibility of the inflated and dilated duodenum.

In asthenic individuals atony of the duodenum with simultaneous atony of the stomach is by no means a rare occurrence, which may often give rise to kinking of the pars horizontalis superior duodeni and prevent timely evacuation of the stomach.

According to our experience, the little ball easily passes the pyloric ring in such cases.

Stagnation of the duodenum can also be diagnosticated by the following procedure. As has been mentioned at another place, the chymus remains in the duodenum for a short time only. It is pathological for the chyme to remain too long—more than 2 or 5 minutes—in that part of the intestine.

Method.—Patient is ordered to take a plate of strained barley soup; one and a half hours later his stomach is thoroughly evacuated and washed out, after which the duodenal tube is introduced. If by means of the latter macroscopic or microscopic food remnants are obtained (i.e., about 1 hour after lavage), there is unquestionably a disturbance of motility, or a stenosis should the residue be large.

Subjective symptoms of this condition are the following: Sensation of pressure more to the right, characteristic almost continuous empty eructations 1 or 2 hours after eating. Another diagnostic sign is the causation of a splashing sound on the right side of the median line, even after lavage of the stomach. Hour-glass stomach and atonic colon must, of course, be previously ruled out.

Gall-Stones.—E. Petry, of Gratz, was the first to show [15] that gall-bladders which contain calculi, also contain smaller concrements of the same nature as the calculi, whether as free deposits or as fragments of the larger stones.

If, he argues, it should be possible to demonstrate these concrements in the bile, the proof of the presence of biliary calculi in the gall-bladder would be adduced.

He introduces, according to *Volhard,* 200 gm of oil into the empty

[15] Wiener klin. Wochensch., 1911, No. 26.

stomach (by the stomach tube, if necessary), and after about an hour he examines the regurgitated duodenal contents for these concrements, the regurgitation being caused by the oil.

By our method we obtain, with the aid of the "duodenal tube," the duodenal contents directly, i.e., without admixture of stomach contents, which is always the case in the oil method, and which may therefore lead to errors in the interpretation of the findings.

We succeeded in a few cases in finding distinct concrements in the aspirated duodenal contents [16] as "free" deposits or fragments which could be identified with stones excreted with the feces or found at operation.

This method seems capable of pointing the way to an elucidation of those frequently veiled conditions (duodenal ulcer, gall-stones, adhesions) of the upper abdominal region.

Finally, it may be mentioned that the diagnosis of so-called typhoid-carriers can be made with the duodenal tube in the quickest and most positive way.

THERAPEUTIC PART

Lavage of the Duodenum.[17]—The lavage of the duodenum is called "direct," because it is not effected by the intermediary of the stomach, but by immediate application of the irrigating fluid through the duodenal tube.

The tube being safely lodged in the duodenum, the desired lavage can be effected with the patient in a sitting or recumbent position by simply pouring the fluid (as is done in gastric lavage) into a glass funnel attached to the outer end of the tube, which is wide enough for this purpose; or by direct filling of the glass ball, the "receptacle." The latter method is indicated if the fluid does not flow off rapidly enough, in which case light blowing through the mouthpiece will insure the desired result.

The liquid may be allowed to flow out, as in gastric lavage, by simply lowering the funnel or the glass receptacle; this is especially done when there is interruption of the outflow which may be affected by light aspiration. Another way is to allow the injected liquid to

[16] Medical Record, April 13, 1912.
[17] N. Y. Medical Record, January 28, 1911.

remain in the duodenum, leaving the functional mechanism of the latter to carry it to the jejunum.

The liquid introduced into the duodenum does not, as might be supposed, flow at once into the jejunum, but, on the contrary, remains for about two to five minutes, according to the quantity used, stationary in the duodenum, in order, apparently, to be conveyed to the jejunum in jerks (duodenal peristalsis).

Up to the present we have resorted to occasional lavage in chronic duodenal catarrh with Karlsbad waters; furthermore, cholelithiasis and pronounced icterus, the object being to liberate both duodenum and common duct from inflammatory and infectious products.

Furthermore, the so-called "Duodenal Pump" (*Einhorn*) has been applied in the treatment of duodenal ulcer by introducing food direct into the duodenum, circumventing the ulcer. This is, in our opinion, not only superfluous, but positively contraindicated, because:

(1) Other less strenuous measures, such as rest, rectal feeding, regulation of diet, bismuth, etc., lead more rapidly and safely to a satisfactory result.

(2) The tube which, according to the instructions of the originator of that method, is left in the duodenum continuously for 10 or 12 days, is liable to incite the duodenum to constant spastic contractions, placing the success of the whole procedure in the presence of an ulcer in jeopardy.

(3) In the majority of the cases direct nutrition through the duodenum is a delusion. The chyme, or the greater part of it, is regurgitated into the stomach, as can be fluoroscopically demonstrated, and the method would therefore, at best, be a mere artificial feeding of the stomach. For similar reasons duodenal nutrition in general ptosis, as advised by the same author, is likewise a delusion.

Disinfection of the Small Intestine by Insufflation of Oxygen.—The idea of using oxygen as an intestinal antiseptic was taken up after *Berger, Hirata* and others had shown that excessive bacterial proliferation could be restricted by introducing nascent oxygen into the small intestine. But the O_2 combination of "oxygar," or peroxid per os, have not achieved any favorable results.

Ad. Schmidt,[18] however, introduced oxygen direct into the small

[18] Zentralblatt f. innere Medizin, 1912, No. 1.

intestine by means of the "duodenal tube," and the results he reported were very favorable. We have since had occasion to repeat this treatment with our "duodenal tube" on a small number of patients and can fully confirm these favorable results not only in cases of pathological fermentation, but also in putrefactive processes.

The change occurring in the pathological intestinal flora after insufflation of oxygen can best be followed with the aid of the *Weigert-Escherich* method (*Gram*). This method supplies information on the intestinal flora and the relation of the putrefactive and fermentative germs to each other. There is no other method, aside from clinical measures, which so clearly indicates an improvement or an exacerbation. The technique, according to *Alexander Schmidt*, is the following:

(1) Boil 2 gm of gentian violet with 200 cc of distilled water for half an hour and filter. (Stable); (2) 11 cc of absolute alcohol are mixed with 3 cc of anilin oil. (Stable); (3) 1 gm of potassium iodide, 60 cc of distilled water (lugol); (4) anilin oil and xylol, in equal parts; (5) xylol.

The feces are finally rubbed up with water and centrifuged, in order to separate the bacilli from the feces. Before staining, they are again centrifuged with alcohol.

The Stain.—Mix (1) and (2) in the proportion of 8½ to 1½ (stable for 2 to 3 weeks). The stain is applied on the slide for ½ minute and carefully tipped off with blotting paper. Then apply lugol on the slide and immediately tip off again. Apply a few drops of anilin oil-xylol and let flow off; repeat until no more blue color is given off. Finally, rinse with pure alcohol and let dry. Weak fuchsin solution (aqueous) is used for the after-stain.

We have adopted the following procedure for the O_2 insufflation: Our duodenal tube [19] is introduced in the morning on an empty stomach down to mark 90 cm, which means about 30 cm beyond the pylorus. This so-called "deep exploration" is particularly desirable for the present purpose, as it prevents the return-escape into the stomach of too large quantities of oxygen. The outer end of the duodenal tube is now connected direct with the regulator of an ordinary O_2 cylinder, and the gas is slowly allowed to flow in. From time to time,

[19] Journ. Am. Med. Assoc., April 23, 1910.

when patient complains of distention, the influx is interrupted. In this way we were able to administer any desired quantity of oxygen. We endeavored to apply a kind of "continuous gas bath" which may last from 1½ to 2 hours.

Instead of making two insufflations a day, as advised by *Ad. Schmidt*, we allowed in one case the tube to remain *in situ* from morning till evening and administered the second insufflation in the evening. In the meantime, patient received liquid food per os, not through the tube.

Expulsion of odorless flatus could often be observed during the administration of oxygen, showing that the gas had passed the ileocecal valve.

As a rule we carried out the following program:

In the	1st	week	1	insufflation	daily
"	2d	"	1	"	every 2 days
"	3d	"	1	"	every 2 days
"	4th	"	1	"	every 3 days

Disturbances which point to serious anatomical changes, localized more in the large intestine (colitis, typhlitis, etc.), may require the applications of O_2 insufflation per anum in addition to the jejunal insufflation or alone. *Ad. Schmidt* also reports favorable results with O_2 insufflation of the colon, notably in intestinal catarrhs of children.

Both objective and subjective results after O_2 insufflation are often so striking that the patient as well as the physician willingly undergo this test of patience. Fermentative and putrefactive dyspepsia as well as catarrhs are favorably influenced by insufflation of oxygen, and above all the annoying symptoms and pain are arrested. Admixture of mucus to the stool is only gradually overcome and is the last symptom to yield to the treatment. Although we have so far only treated 9 cases, we feel that our method serves its purpose exceptionally well and is worthy of being tested by others.

The diet is most carefully regulated as before.

It is, of course, impossible, and a positive mistake, to try to completely clean out the intestine from bacteria; our endeavors should mainly be confined to preventing overproliferation of bacteria.

The object of the dietary measures is above all to obtain a normal intestinal wall. An efficient intestinal mucosa will furnish the friendly

bacteria with improved conditions of living, while the pathologic bacteria are deprived of a favorable culture ground.

The insufflation of oxygen will prove of incalculable value, as it will exert a directly inhibitive or paralyzing effect upon the highly pathological bacteria (anaërobes) by rendering their conditions of life unfavorable.

CHAPTER X

Diseases of the Pancreas

Since the function of the pancreas is most important for digestion owing to the fact that by means of its secretion all three groups of foodstuffs are changed into soluble, absorbable substances, we consider it essential to include the diseases of the pancreas among those of the gastro-intestinal tract.

Physiology of the Pancreas.—The knowledge of the pancreatic secretion has been derived from a study of temporary and permanent fistulæ. From a temporary fistula a clear, colorless, viscid fluid is obtained which is alkaline in reaction. On cooling, a gelatinous mass separates. From a permanent fistula, a thin fluid results, which does not become gelatinous in cooling. The pancreatic juice putrifies readily when allowed to stand.

The ferments are contained in the gland in the form of zymogen, becoming active after long exposure to the air, or through the influence of weak acids. The ferments are trypsin for the digestion of proteids, steapsin for the digestion of fats, and amylopsin for the digestion of starches. There is also a milk-coagulating ferment.

It has been found that meat increases the trypsin ferment and decreases the amylolytic ferment.

While the physiological function of the pancreas is clear up to a certain point, viz., its function in the collaboration and assimilation of food, the pancreas also possesses an internal property which leads to the change of sugar. The latter function, however, is not so clearly understood. One would think that disturbance of the function due to that of the pancreas would give rise to such symptoms that the recognition of its quantity and quality would be an easy matter. The facts, however, are different for the following reasons:

(1) For each physiological function of the pancreas, concerning digestion, there is a compensating organ qualified to do the work neglected by the failure of the pancreatic function.

(2) The pancreas has two excretory ducts: in the event of one becoming obstructed, the second assumes its duties.

(3) A large portion of the gland may be destroyed and the remaining healthy portion will do the work of the entire gland.

(4) Pancreatic diseases are usually associated with diseases of the stomach, duodenum or liver, and the symptoms are thereby masked.

Etiology.—Of the etiological factors that would aid us in the diagnosis we know little. *Albu* divides the cases according to etiology as follows:

(a) Those due to trauma, to which the so-called pancreatic apoplexy belongs, where there is a hemorrhage of the parenchyma of the organ or in the subperitoneal tissue (bursa omentalis), and the disease terminating fatally with symptoms of peritonitis and ileus; cysts of the pancreas on account of trauma of *Wirsung's* duct.

(b) Arteriosclerosis may lead to acute or chronic hemorrhagic conditions.

(c) Syphilis may produce connective tissue changes.

(d) Alcoholism may lead to catarrhal changes of the gastro-intestinal tract, a most frequent consequence being the extension of the catarrhal changes to the biliary tract, and thence to the pancreas.

(e) For the formation of stones in the pancreas, the same predisposing causes exist as for cholelithiasis, viz., obesity, atony of the bowels and diathesis.

General Symptomatology.—The general symptoms are those of digestive disturbances and not characteristic. Only a limited number of symptoms may lead to suspect a disease of the pancreas. We shall see, however, that a combination of the symptoms and functional test will help us in establishing a proper diagnosis.

Subjective symptoms are almost always dyspeptic, like loss of appetite, belching, nausea, pressure and sensation of fulness in the epigastrium, repugnance to meat. Vomiting is likewise a frequent symptom, upon which some authors even place great diagnostic value, especially so if the vomitus frequently contains pancreatic juice, as *Glaessner*,[1] and also *Th. Brugsch*, showed on a patient.

The constant presence of bile in the vomitus is a characteristic

[1] Zeitsch. f. exper. Pathol. and Ther., 1907, Vol. 4.

feature, provided biliary diseases and regurgitation through the pylorus can be excluded. Ptyalism is considered by some a pathognomonic symptom, because there is a relation between the pancreas and the salivary glands, the latter assuming vicarious function in pancreatic disease.

Pain in the epigastric region is not diagnostic. The kind of pain, however, its sudden onset, its extraordinary severity, and the inability to touch the part when the pain is present, may awaken suspicion. The pain is almost around the umbilicus, radiating to the left hypochondrium. There is also extreme tenderness in that location. There is very frequently constipation, but there may be diarrhea. When we find voluminous claylike stools, and biliary disease can be excluded, we have an important diagnostic aid.

Objective Symptoms.—In most cases marked loss of weight is at once noticeable. Intermittent icterus, which is due to pressure of the inflamed and infiltrated head of the pancreas on the ductus choledochus, is frequently present. Icterus plus hydrops of the gallbladder, the latter being due to pressure on the cystic duct, makes pancreatic disease very suspicious.

Of late, some authors have observed bronze pigmentation of the skin in pancreatic diseases. Above all, we should value careful palpation of the upper part of the abdomen. Careful palpation of the pancreas in particularly thin persons, as practiced by ***Haussmann***, is very valuable. The diseased pancreas may then be felt as a narrow, irregular, transversely situated organ above the transverse colon, and is not movable with respiration.

Repeated examination for the presence of glucose in the urine should not be neglected; maltose has also been found by ***Rosenheim*** and ***Flataw***. The test for alimentary glycosuria should always be carried out, by giving patients 100 gm of glucose and testing the urine every twenty-four hours in order to find out if sugar is found. ***Albu*** lays great stress upon the fact that whenever diabetes is found as the result of pancreatic disease, it is of a severe form, acetone and diacetic acid being found in the urine.

A. Functional Diagnosis

(1) Functional diagnosis is subdivided into disturbances of external secretion (digestive function of the pancreas), which will occur by compression of the duct of *Wirsung* at its entrance into the duodenum or complete cystic degeneration of the entire pancreas.

(2) Disturbances of internal secretion, especially the function of the pancreas in carbohydrate metabolism.

FUNCTIONAL DISTURBANCES OF DIGESTION

Disturbances in the Digestion of Proteids.—Theo. Brugsch considers that acotorrhea (presence of connective tissue in the stools) is a characteristic indication of pancreatic disease, contrary to other observers, like *Ehrmann, Schittenhelm* and *Albu,* who consider acotorrhea significant only, if the intestinal function is normal and there is no achylia. More characteristic is creatorrhea. Muscle fibres are at times even recognized macroscopically. The value of creatorrhea is strengthened by the finding of fatty stools, or stercorrhea.

Methods of determining disturbances of tryptic digestion:

a.—*Sahli's Glutoid Capsule Method.*—A gelatin capsule hardened in formalin, together with 0.15 iodoform or salicylic acid, or methylene blue. These are insoluble in the gastric juice, but only soluble by trypsin. The finding of the substance in the saliva, respectively in the urine, shows the presence of trypsin.

b.—*The Method of Müller and Schlecht.*—Gelodurat capsules are filled with charcoal. This capsule is placed into 10 cc of thin feces of the patient. At 98 the capsule dissolves in the presence of trypsin.

More conclusive is a direct finding of trypsin in the feces, which can be determined by examination on serum plates. For this purpose the patient is to ingest a meal of 150 gm of meat and 150 gm of mashed potatoes the day before the examination. We must also make sure that the stool is free from blood, pus and leucocytes. The patient is given a laxative in the morning of examination of the stool; the stool obtained must be made alkaline by sodium hydroxid. A thin part of the feces is placed on the serum plate. At 98, a depression will form in the serum.

For the quantitative method, put in one part of the serum plate feces undiluted and in the other part of the serum plate 1:10 and 1:20, 1:100 and 1:200, and note which still forms indentation. In fatty stools, the fat should be first abstracted by ether.

c.—*Casein Method of Gross.*—Originally devised for the quantitative determination of pepsin, *Gross* has utilized his method with a slight modification for the examination of trypsin. It is a very practical method, because it can be readily carried out and is quite reliable. It is based upon the fact that casein in an alkaline medium is digested by trypsin, which by the addition of dilute acetic acid again coagulates.

Test.—0.5 casein is dissolved by heat. One litre of a 1% soda solution is made to keep by the addition of a little chloroform. The stool is obtained by a laxative and treated with 3 parts of the 1% soda solution, rubbed up and filtered. To each 10 cc of casein solution are added the filtered feces, which are allowed to stand in the incubator at 98° F. for 10 to 15 hours. Normally, there is complete digestion of the casein solution, so that on addition of a 1% acetic-acid solution there is no cloudiness.

d.—*Volhard's Method* is very reliable, but too complicated for the use of the general practitioner.

The objection to all the methods is that erepsin coming from the small intestine may be responsible for the digestion of albumin, pepsin and casein. For this reason methods have been devised to obtain trypsin from the stomach contents. The method is based upon the fact that, normally, there is slight regurgitation of pancreatic juice into the stomach. Absence of the same speaks for pancreatic disturbance.

In carrying out the method, the patient receives 1 dram of magnesia ustæ, and ½ hour later 200 cc of olive oil or, which is still better, 250 cc of sweet cream. Half an hour later again 1 dram of magnesia ustæ. The stomach is emptied ¾ of an hour later, and the *Gross* method for the examination is carried out. According to *Brugsch*, the negative findings of trypsin are only conclusive if erepsin is present.

e.—*Adolf Schmidt's Cellular Nucleus Test* is based upon the fact that nuclease which digests cellular nuclei is only present in the pancreatic juice. *Schmidt* adds to the regular diet small pieces of meat,

½ cm in width, hardened in alcohol and placed in a gauze bag. The gauze bag is recovered in the feces, and fibres are looked for. In cases of insufficiency of the pancreas, there are also muscles well maintained and nuclear substances. The test is only of value if the meat has been in the intestine not less than 6 hours and not more than 36 hours, because in the former case there was no time for digestion to take place, and in the latter case dissolution of the nuclei may have been brought about by putrefaction.

DISTURBANCES IN THE DIGESTION OF FAT

With considerable destruction of the pancreas, fat is found in the stool either in large masses or only microscopically visible fat globules, fatty acid crystals, or sometimes they may be seen by the osmin treatment, staining the specimen black. Sometimes pure fat, the so-called butter stools, may be observed. The partial disappearance of fat in the stool after administration of pancreon is of very great diagnostic value.

The many examinations with reference to fat absorption have not yielded any practical results so far, and hence we shall not mention them.

Of late, however, *one test mentioned by Ehrmann*,[2] is based upon the fact that neutral fat, free from fatty acid, is split by the lipase from the pancreas, the resulting acid forming green salts with copper. We shall describe the technique.

The patient is given, on a fasting stomach, 30 gm of rice flour, dissolved in a cupful of warm water, to which is added 75 gm of liquid palmitin. This test meal is extracted within 2½ hours. It is then thoroughly mixed and well shaken with petroleum ether containing 10 per cent. benzol. The ethereal extract is then mixed with a 3 per cent. solution of copper acetate in distilled water. An emerald green color in the ethereal layer indicates pancreatic activity. If no color change results, pancreatic lipase is absent. Hydrochloric acid in the gastric contents may interfere with the test. It is therefore advisable to add soda to the test meal to overcome the acidity.

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[2] Berlin. klin. Wochensch., July 15, 1912.

DISTURBANCES IN DIGESTION OF CARBOHYDRATES

In order to find diastase in the stools, the method of *Wynhausen* is used. Filtered feces, in different dilutions up to one-tenth strength, are put into a few test-tubes and 5 cc of a 1% solution of starch is added. The tubes are put into an incubator for 24 hours at a temperature of 105° F.; then distilled water is added to about one inch from the rim of the tube. Into each 1 drop of a one-tenth normal iodine solution is added. If starch is present, there will be a blue color; with erythrodextrin red color will appear, and with achrodextrin there will be no color at all.

We may say that the *Duodenal Tube, devised by M. Gross*, has helped us in directly obtaining the pancreatic juice from the duodenum, and will considerably aid in making the diagnosis. A description is given in a special chapter.

DISTURBANCES OF INTERNAL SECRETION OF THE PANCREAS

That there is some relation between some cases of pancreatic disease and diabetic affections, was clinically known for fifty years. *Frerich* and *Segen*, in Germany, *Lancereaux* and *Bouchart*, in France, have found in some cases of diabetes post-mortem pathological changes in the pancreas. The association of diabetes with pancreatic disease received firm support through the fundamental experiments of *Mehring* and *Minkowski*.

It is not within the scope of this work to go into a detailed description, but some of the results should receive mention. *Minkowski* found that after partial extirpation of the pancreas there was no diabetes. To prove that the gland itself and not injury to the nerve is responsible for the diabetes, he removed the pancreas of a dog and transplanted it back under the skin, where it healed in, and there was no diabetes. If the removal of the pancreas caused diabetes, it could be concluded that there must be something in the function of this organ that participates in the carbohydrate metabolism, and we can safely consider as one of the functions of the pancreas, glycolosis, which is brought about by a ferment existing in the parenchyma of

the pancreas, without any influence of the juice excreted outside of the pancreas, because ligation of the excretory ducts does not cause diabetes. Therefore, the function of the pancreas in glycolosis is known as internal secretion.

The relation of the pancreas to the thyroid was established by *Falter*,[3] who observed fatty stools in connection with alimentary glycosuria in *Basedow's* disease, too. The glands of the blood-vessels, viz., the suprarenal glands, are connected with the pancreas, as shown by *O. Loewi*.[4] He produced adrenalin mydriasis, which lasted a few hours, by instilling a few drops of 1 : 1000 adrenalin solution into the eye of a patient suffering from pancreatic disease.

Of all, the glycogenic functions of the pancreas, as an internal secretory property, is the best established. From a practical standpoint it is worthy of mention that a pancreatic diabetes is a serious one, as there is great tendency to acetonuria. It is only present, if the parenchyma is diseased, as in carcinoma, atrophy and necrosis of the gland. Within the last few years it was learned that diabetes depends upon the disease being located in the islands of *Langerhans*. In connection with the relation of the pancreatic function to carbohydrate metabolism, the *Cammidge* reaction must be mentioned, although the technique is extremely complicated and many observers have not seen any pathogenic significance.

Technique.—To 20 cc of urine, free from albumin and sugar, 1 cc of hydrochloric acid is added, and slowly boiled for 10 minutes. The fluid is cooled and again filled to 20 cc with distilled water. Four gm of lead carbonate are added to neutralize the hydrochloric acid. Add the lead carbonate slowly and shake. Now filter and add 4 gm of powdered lead acetate, shake and filter again. In order to remove the rest of the lead, 2 grams of powdered sodium sulphite is added. Boil a little and filter again. To 10 cc of the filtrate 8 cc of the distilled water is added, then 0.8 phenylhydrasin hydrochlorium, 8 gm of soda acetate, 1 cc of acetic acid, the whole is boiled for 10 minutes and filtered while hot. Add up to 15 cc of distilled water, until we are positive to have a yellow flake-like deposit. Microscopically there can be seen fine yellow, delicate needles, which,

[3] Kongress f. innere Med., 1910.
[4] Arch. f. experim. Pathol. and Therap., 1909, Vol. 60.

on addition of 30% sulphuric acid, will dissolve. Other substances causing the reaction are glycerin, pentose, glyconuoleoproteids.

B. Special Diagnosis

(*1*) *Pancreatic Apoplexy.*—Pancreatic apoplexy is a disease characterized by sudden onset, severe abdominal pain, especially in the upper part of the abdomen, extreme meteorism, absolute constipation and collapse. Post-mortem bleeding into the pancreas is found. It occurs in people with arteriosclerosis and those that have the status apoplecticus. It must not be confused with hemorrhagic pancreatis or with necrosis. The disease is invariably fatal.

(*2*) *Acute Hemorrhagic Pancreatitis* is an acute inflammation of the entire parenchyma with diffuse bleeding into the organ. It mostly attacks people of middle age, preferably obese people. Some authors found arteriosclerosis and lues a predisposing factor. Trauma certainly predisposes. In some cases there is an antecedent history of gastric or biliary disturbances.

The symptoms are not characteristic, hence the diagnosis is very difficult. Two diseases that very much simulate the disease in question are acute ileus and perforating peritonitis. As diagnostic points we may take into consideration the pain being more in the upper quadrant of the abdomen, the extreme tenderness and rigidity in that portion of the abdomen, the early collapse, no leucocytosis, and absence of temperature. Spontaneous healing has been reported in a few cases; surgical interference has also yielded some favorable results.

In all cases the prognosis is extremely grave.

(*3*) *Suppurative Pancreatitis* (*Abscess*).—This disease, although setting in abruptly, is preceded by symptoms of gastric disturbances, such as pressure on the epigastrium, slight icterus, nausea, irregular temperature. Then comes the acute onset, which is characterized by the symptoms described for hemorrhagic pancreatitis; there are chills, irregular temperature and leucocytosis. The urine should be repeatedly examined for the presence of sugar. A palpable tumor is a rare occurrence, but it has been observed by some authors. The specific tests of the stool should be carried out.

The prognosis is grave, unless surgical interference achieves favorable results.

(*4*) *Chronic, Indurative Pancreatitis* (*Cirrhosis Pancreatica*).—The symptoms are those of intermittent gastric disturbances: slight icterus; pain varying in severity in the upper portion of the abdomen; sugar at times in the urine. Frequent examination of the feces and the finding of the above characteristic symptoms will frequently aid in establishing a diagnosis. A test for alimentary glycosuria should always be made.

(*5*) *Syphilitic Pancreatitis* occurs either by the formation of a gumma or as interstitial changes. The diagnosis is clinically only possible when there is evidence of disease of the pancreas, plus syphilitic manifestations in other parts of the body, and a positive Wassermann.

(*6*) *Necrosis of the Pancreas. Symptoms.*—The onset is sudden, with extreme abdominal pain almost over the entire abdomen with distention of the upper part, and rigidity. The other symptoms of ileus and peritonitis are likewise present at intervals. The acute symptoms, however, subside, as a rule, and the subacute stage results, which is characterized by frequent rises of temperature and attacks of pain of varying severity, with free intervals. Frequent examinations of the stools, examination of the urine for sugar and acetonuria will aid in the diagnosis. Sometimes there is an elastic swelling in the upper part of the abdomen, which is of great diagnostic value. Such a swelling should not be mistaken for hydronephrosis, pyelonephrosis, intraperitoneal cysts or intra-abdominal abscess.

(*7*) *Stones of the Pancreas* are a very rare occurrence. Symptoms arise, when the ducts become obstructed and give rise to secondary changes in the parenchyma of the pancreas. They are frequently associated with cholelithiasis. A stone in the pancreas invariably leads to chronic pancreatitis, sometimes to atrophy, and even abscesses or necrosis. The colicky attacks of pancreatic stones are not easily differentiated from renal and biliary colic. The differential points, however, are the following: There are, even in the intervals, pressure pains of the stomach without any jaundice. The pains radiate to the left hypochondrium, are lower down and in the region of the umbilicus. There is also more severe bilious vomiting. There is great tenderness in the region of the pancreas. Above all, diabetes is more frequent in this affection than in any other form of

pancreatic disease, or rather there is at least glycosuria present during the attacks. There is no bile, urobilin or uribilinogen in the urine. *Eichhorst* lays stress on the presence of salivation.

(*8*) *Cysts of the Pancreas* are of great practical value, as in this affection surgical interference leads to a better result than in any other pancreatic affection. It is of no practical importance whether the cysts are traumatic or blood cysts. They are palpable, after they have attained the size of a plum; they are likely to grow and contain many quarts of fluid. The attacks of pain over the pancreatic region are most important. Objectively, the fact of a mass being felt above the umbilicus which is not movable with respiration and has a smooth, elastic surface, is characteristic. By insufflation of the stomach and intestine disease of these organs can be excluded. Sometimes the swelling may entirely disappear by emptying itself into the intestine and then refilling. Two such cases were observed by *Albu*.[5] As the cysts are mostly at the head of the pancreas, there may be icterus on account of pressure of the ductus choledochus, or hydrops of the gall-bladder on account of pressure on the cystic duct, or they may be both combined, because both ducts are compressed. There may also be pyloric or duodenal stenosis on account of pressure. A case of traumatic cyst of the pancreas, operated upon successfully by *A. E. Isaacs*, was reported by the same in the Medical Record, June 12, 1912.

Disturbed intestinal absorptive power may give rise to emaciation. On the other hand, creatorrhea, steatorrhea, diabetes, alimentary glycosuria, and absence of trypsin are but seldom observed in this affection.

(*9*) *Carcinoma of the Pancreas*.—This is the most frequent of pancreatic diseases, very often primary, sometimes secondary. The symptoms may be divided into:

a. Where there was no symptom during life and the disease was accidentally discovered at autopsy, the disease involving but a small part of the gland.

b. Where there is severe digestive disturbance, rapid emaciation and cachexia, which are no characteristic signs of pancreatic disturbance.

[5] Beitr. z. Diagn. der innern u. chirurg. Pankreaskrankh., Halle a. d. Saale, 1911.

c. Cases with fat stools, positive specific reaction, acetonuria and glycosuria;

d. Cases where compression of the ductus choledochus leads to jaundice, and where there is at the time compression of the cystic duct leading to hydrops of the gall-bladder.

e. Cases where compression of the pylorus or the beginning part of the duodenum give rise to symptoms of pyloric obstruction.

(*10*) *Atrophy of the Pancreas.*—This disease is more of pathologic anatomic interest, because its recognition in life is not yet established. A few cases have been reported in the literature, where severe diabetes with marked digestive disturbances led to suspicion, especially in cases with large, soft stools of the clay color type, with marked weakness, extreme thirst, attacks of pain in the upper part of the abdomen, creatorrhea and steatorrhea.

Therapy.—Of late it has been shown that there are undoubtedly many cases of light pancreatic affections which lend themselves to dietetic and medicinal treatment. The diet must be entirely conducted according to the stools, whether diabetes is present or absent. The fat only, as milk up to a quart daily, the meat finely chopped, or chicken should be allowed up to 125 grams daily, light puddings, barley and oatmeal soup, if there is no sugar in the urine. Eggs are allowed, cooked fruit, tea or coffee with sweet cream, kephyr, yoghurt, buttermilk or sweet milk may be allowed to excess, provided there are no oily or fatty stools or albumin. The presence of acetonuria indicates large doses of sodium bicarbonate and increased amounts of carbohydrates. The best drug to be used is pancreon or pancreatin, 0.3, three times daily. Also the associated stage of the gastric secretion should be considered: in achylia hydrochloric acid should be given, in hyperacidity alkalies.

The other pancreatic diseases must be treated surgically.

Crohn [6] employs the following methods of examination of the duodenal juice for pancreatic ferments:

Amylopsin.—Into several tubes 1 cc of juice is placed, increasing amounts of 0.5 to 6.0 cc of a 1% starch (*Kahlbaum*) solution are added to the successive tubes, and then water to bring the volume up to 10 cc. We incubate at 40° C. for one hour; after that we add

[6] American Journal of the Medical Sciences, March, 1913.

into each tube lugol solution, drop by drop, until an excess of iodin is apparent. From the last tube not reacting to starch, the reading is taken. The number of cc of starch in that test-tube is multiplied by three (3), which is the dilution of the duodenal juice. The result represents the amylolitic activity of 1 cc of duodenal juice in 1 hour.

Steapsin.—To 10 cc of distilled water are added 1 cc of 1-3 duodenal juice, 1 cc of æthyl butirate, 1 cc of toluol and 1 drop of a 1% alcoholic-phenophtalein solution. It is made neutral with $\frac{1}{10}$ normal sodium hydroxid, and the amount of fluid brought up to 25 cc. The flask is stoppered and shaken for 15 seconds. A control test is prepared by boiling the juice for 5 minutes before addition to the flask. After 24 hours' incubation at 40° C., the two flasks are titrated for free acids and the amount necessary to bring the control to neutral subtracted from the free acid in the test flask, the result multiplied by 3 denotes the lipolytic strength of the test material.

Trypsin.—The *O. Gross* casein or the *Mett* coagulated albumin tubes as applied for feces are applicable for the duodenal juice.

CHAPTER XI

X-ray Diagnosis of the Gastro-Intestinal Tract

X-ray examination is proving to be a most useful aid in the diagnosis of the gastro-intestinal tract. In this branch of internal medicine more than in any other, it is most essential to have all the preliminary data and clinical examinations of the gastro-intestinal tract on hand, and to use the X-ray only for the purpose of confirming or completing the clinical diagnosis.

X-RAY EXAMINATION OF THE ESOPHAGUS

The course of the esophageal tube is uneven (see Fig. 27). The tube is about 4 mm thick. In the cervical region it runs to the left of the vertebra; at the trachea it turns to the median line and runs along to the 7th dorsal vertebra, where it again turns to the left, and at the 11th dorsal vertebra it merges with the stomach.

Age influences its course, and so do individual differences.

The best sound for examination of the esophagus by the X-ray is one filled with lead. With such a sound introduced, we can follow the course of the esophagus and can see it at 3 points according to the position of the patient. We can see the lead sound in the cervical region in the anterior and posterior aspects.

On turning the patient diagonally, with both his hands raised above his head, we can see the tracheal portion, below which the sound runs again to the left to the 11th dorsal vertebra.

The positions we utilize for examination of the esophagus are the first diagonal or the ventro-dorsal position, the tube behind and to the right, screen in front to the left; the second diagonal or dorso-ventral position, tube behind and to the left, screen right front.

For the purpose of seeing the food going down the esophagus,

we can utilize 15 to 20 gm of bismuth in 100 gm of milk or 50 gm of mashed potatoes or a cereal with 20 gm of bismuth; also a bismuth capsule containing 2 gm of bismuth. Normally the food shoots down in about one-tenth of a second, and we see three natural constricting points: (1) at the cricoid cartilage, (2) at the fourth cervical vertebra (aorta constriction), and (3) below the diaphragm at the cardia.

While the food is going down the esophagus, we can see contractions corresponding to the course of the muscle fibres of the esophagus.

Fig. 27.—Normal Esophagus.

Pathological conditions to be looked for: We may see a normal esophagus displaced by neighboring organs. In diseases of the esophageal wall we look for diverticulum, spindle-shaped esophagus, stenosis of either the obstructive or spastic type.

DILATATION ABOVE STENOSIS

The *Zucker* pharyngo-esophageal pulsating diverticulum is situated in the cervical region of the esophagus; its size varies from a cherry to that of an infant's head.

The diagnosis of a diverticulum is based upon the fact that the

bismuth meal, while leaving the entire esophagus proper, is retained in part at one point.

Stenosis of an organic type is evidenced by the bismuth stopping at a certain height; atropin, 0.0006 hypodermatically, does not influence the stenosis and, besides, there is some degree of dilatation above the stenosis, showing unevenness of the esophageal tube (Fig. 28).

A spastic contraction, causing stenosis, is cleared up by the use of atropin, which relieves the spasm.

Fig 28.—Stenosis of Esophagus with Dilatation Above.

Foreign bodies can be located in the esophagus.

Whenever a high degree of stenosis (Fig. 29) is suspected, only bismuth milk should be used.

X-RAY EXAMINATION OF THE STOMACH

The patient should come with an empty stomach and thoroughly evacuated bowels.

The test meal is that advised by *Rieder*, consisting of 40 to 50 gm of bismuth. carbon., mixed with 2 tablespoonfuls of sugar of milk and stirred up with water. This is added to 250 gm of either farina cooked in milk, mashed potatoes, spinach or apple sauce.

A coin is fastened on the umbilicus. The patient is placed in the first diagonal position so that the food can be seen going down the esophagus.

When the first spoonful of the food reaches the cardia, the patient is turned with his front to the screen, we have him eat his meal, and watch how the stomach is being filled.

We can now see the size, position, peristaltic contraction, form and relation of the stomach. This is done with the patient in the erect position. Half an hour after the first examination part of the

Fig. 29.—High Degree of Stenosis of the Cardia with Marked Dilatation Above.

bismuth begins to be seen in the small intestine. The examination should then be made every 3 hours, then every 6 hours, then after 12 to 24 and even 48 hours, to see how the bismuth passes through the entire gastro-intestinal tract.

Under rare circumstances, where the patient cannot tolerate bismuth, 400 gm of buttermilk, with 100 gm of bolus alba mixed up, may be substituted. Barium sulphate in 40 gm doses may also be added to the buttermilk instead of the bolus alba.

When the picture of the large intestine is to be taken, it is done by means of an enema made up as follows:

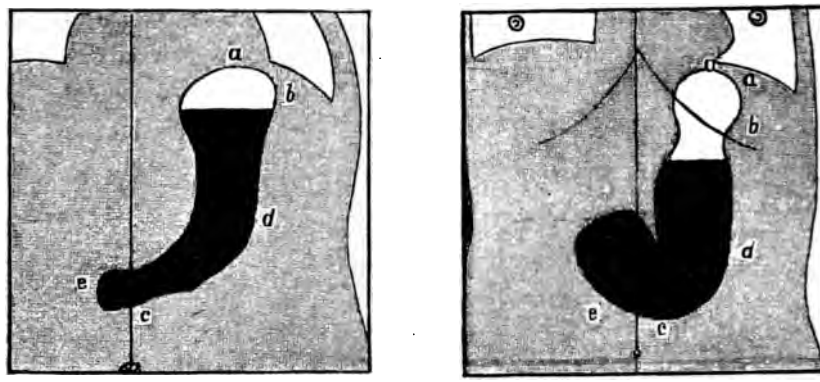
Bism. carbon.	75	gm
Bolus alba	300	gm
Aqua	1500 to 2000	gm warmed up

This is given as a low enema, with the patient on his left side. When the enema is all in, light massage of the abdomen in the direction of the colon is made for a few minutes. The picture is taken with the patient on the abdomen.

Stierlin * prefers the following procedure for the X-ray examination of the gastro-intestinal tract:

Patient gets *Rieder's* meal by mouth and the bismuth-bolus enema per rectum.

In this manner the exact relation between stomach and colon can be observed.



A. B.

FIG 30.—A, Cowhorn-shaped Stomach. B, Hook-shaped Stomach. *a, b,* air-chamber; *c,* lowest part of stomach; *d,* fundus; *e,* pyloric end.

The patient is then seen every 3 hours in order to differentiate the shape of the colon after it frees from above.

In order to have a still clearer view of the relations of stomach and large bowels, *Stierlin* gives a contrast *Rieder* meal by mouth when the colon is filled with the bismuth given 24 hours before.

We had also occasion to follow out this method and found it very useful and indicated in cases where we suspected the seat of the disease in the left hypochondrium (splenic flexure or in the transverse colon). In angulation of the flexure the bismuth is missing in that portion. We are also enabled to trace depressions on the greater curvature of the stomach caused by tumors outside of the stomach.

* Munch. med. Wochen., 15, 16, 1912.

Normal Stomach (Fig. 30).—Below and to the left of the cardia, just under the diaphragm, there is an oval light zone which, according to *F. A. Hoffman*, consists of air and is known as the "Magenblase," or air-chamber. According to *Franz Groedel*, it is best seen after a meal, and is largest when large quantities of fluid are taken with the meals.

The air-chamber disappears when the patient lies down. The progress of the bismuth is first seen at the bottom of the air-chamber,

FIG. 31.—Normal Stomach One Hour After a Meal. Some bismuth seen in the small intestine.

moving down gradually, and reaching the lowest point of the stomach where a wavelike contraction is usually seen. It then proceeds to the pylorus, where we first see a constriction at the antrum pylori (see Fig. 31), which gradually deepens above. It then meets with a similar constriction at the lower part of the greater curvature and finally entirely separates the bismuth of the pyloric part from the mass of the fundus of the stomach.

We can also observe fluoroscopically that fluid leaves the stomach quicker than solids.

By watching the stomach hourly through the fluoroscope, it can be observed how it empties itself as a whole. The stomach is normally empty after 3 to 4 hours.

Schwartz advises the use of bismuth, 4 gm, and 0.25 pepsin put

into a fibrodermoid capsule in order to determine the presence of hydrochloric acid in cases where the stomach tube is contraindicated. Normally the capsule is dissolved within ½ to 1 hour, and the bismuth is seen as a long streak in the lower part of the stomach; a delay in the dissolving process shows a diminution of HCl, and if after 6 hours the capsule is still undissolved, we can conclude HCl is absent.

Next we are to study position, shape, size and motility of the stomach.

Position.—Normally, the greater part of the stomach lies to the left of the median line, while the pyloric part lies either in the median line or a little to the right, and the greater curvature lies at the umbilicus or two fingers above. Abnormal position of the stomach depends upon its displacement by adjacent organs, their tumors, adhesions, or general ptosis. The position of the pylorus is more prone to change than the rest of the stomach. A pylorus mobile is frequently seen in *Stiller's* habitus, neurasthenia and anemia.

Shape.—The normal shape is the "Hook-form" (Hakenmagen). Deviations from that shape depend upon all the conditions that influence the position of the stomach, and also the tonicity of the stomach. *Rieder's* "bull-horn" stomach (Rindshornmagen) is still within normal limits. A transversely situated stomach, if not due to pressure from below or adhesions of the pylorus, is already pathologic.

If the stomach is transversely situated and well above the umbilicus, we can conclude that the cause of the position lies outside of the stomach and is due to pyloric adhesions or pressure from below.

If the stomach is transversely situated and reaches the umbilicus or is below, we deal with a disease of the stomach wall proper.

Size.—For the exact size of the stomach only the use of the orthodiagram, as advised by *Levy-Dorn*, is conclusive. However, as this method is not a simple one, we have to rely upon the fluoroscope and the relation of the lesser and greater curvature to the umbilicus. If, for instance, the entire stomach is below the umbilicus, we speak of ptosis; if, on the other hand, the greater curvature is well below the umbilicus and the lesser curvature above, it is usually due to an enlarged stomach, which may assume the shape of a sack (Magensack).

Motility.—The motility of the stomach is best determined by the time the stomach empties itself; normally within 3 to 4 hours. As the motility depends a great deal upon the tone of the stomach, *Holzknecht* differentiates four types (see Fig. 32): (1) The hyper-

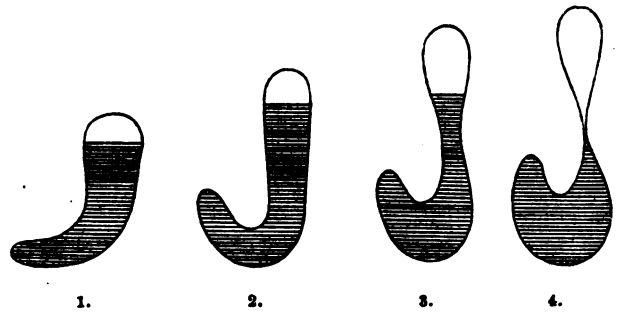


FIG. 32.—Types of Stomach.
1, hypertonic; 2, orthotonic; 3, hypotonic; 4, atonic.

tonic type, where the stomach is found empty about 2 to 2½ hours after a meal; (2) the orthotonic, where the stomach empties itself normally; (3) the hypotonic, where the stomach empties itself within 5 to 6 hours; (4) the atonic, in 6 to 8 hours, and where the stomach is hardly at any time found empty, which is due to a high degree of obstruction.

Alfred Weil determines the motility of the stomach in the following way:

Patient swallows on an empty stomach two indissoluble capsules, one filled with bismuth, 0.5, and the other with bismuth plus a piece of cork. Normally, i.e., without any residual fluid from the day before, both capsules are near each other. In pathological conditions, i.e., with residues present, they are away from each other by 10 cm and more. The greater the distance the more residual fluid. He even draws conclusions as to the tonicity of the stomach. After the capsules have arrived in the stomach, he gives the patient a glass of water, and if the capsules separate from each other in a longitudinal direction, he considers the organ of normal tone; if, on the other hand, they are transversely situated, he speaks of an atonic muscle.

The contractions of the stomach are also seen fluoroscopically. They are of three kinds: the upper part of the stomach (fundus)

shows a superficial wavelike contraction, corresponding to the peristole, another wavelike contraction along the upper part of the greater curvature, and finally a deep wavelike contraction at the lower part of the greater curvature.

Increased contractibility to the right is associated with hypermotility, diminished contractibility speaks for adhesions of the stomach, or atonic conditions.

Visible antiperistalsis is seen in cases of obstruction at the pylorus.

The greatest achievement by the X-ray work can be claimed if

FIG. 33.—Diffused Cancer of the Stomach.

FIG. 34.—Cancer of the Stomach.

early diagnosis of cancer and ulcus of the stomach can be made. Work in that direction was done by *Tomas, Jolasse, Holzknecht, Haudek* and *Clairmont, von Bergmann, Hemmeter* and *Pfahler, Cole, Jaches, T. S. Hirsch,* in the United States.

Holzknecht was the first to utilize his clinical experience and the chemical examinations of the stomach contents. He combined this with X-ray findings, and in this way he laid down rules to diagnose early cancer and ulcer of the stomach. Many of his findings were confirmed surgically.

Cancer (Figs. 33, 34 and 35).—(1) Some rest of the bismuth meal 6 hours after; (2) morphologically no change in the stomach; (3) chemically, absence of HCl.

Conclusion.—Small cancer at the pylorus, operable.

Reasons for such conclusion: We know clinically that, where there is achylia gastrica, there is an open pylorus and the stomach empties itself very early. If, therefore, with such a condition a rest of bismuth is found 6 hours after, it must be due to some obstruction at the pylorus. The reason why we consider the condition operable is because only a small rest is found 6 hours after meals.

When we cannot determine the acidity by the stomach tube, we resort to the above-mentioned fibrodermoid capsule filled with bis-

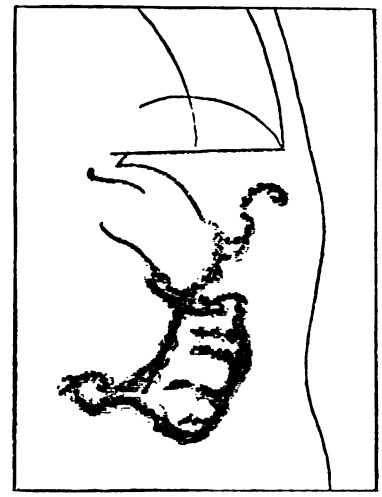


FIG. 35.—Diffused Carcinoma.

muth and pepsin, and examine 6 hours later and see whether the capsule is opened or not (HCl absent). The bismuth meal is given and examined again 6 hours, and if we find (1) rest after 6 hours, (2) morphologically no change, (3) fibrodermoid capsule not opened after 5 hours, there is a small carcinoma at the pylorus.

Another Modification of the Test.—We know normally that with achylia gastrica the stomach is empty after 3 hours and after 6 hours the bismuth is already seen in the splenic flexure. If, therefore, there is (1) rest in stomach after 6 hours, (2) morphologically no change, (3) bismuth in the splenic flexure, there is a small carcinoma at the pylorus.

(1) No rest after 6 hours, (2) distinct defect in the filling of the stomach (Füllungsdefekt), (3) the cow-horn stomach: conclusion

—inoperable carcinoma of the stomach without stenosis. The cow-horn stomach and the defective filling speak for a retraction in some portion of the stomach, and to cause such a retraction, a diffuse carcinoma is necessary.

If, on the other hand, the hook-form of the stomach is maintained, although there is a defect in filling, the cancer is operable. Hence the following rule: (1) no rest after 6 hours, (2) defect in the filling of the stomach, (3) hook-shaped stomach: conclusion—operable carcinoma without stenosis.

Ulcus Ventriculi

In no other pathological condition of the gastro-intestinal tract is it so necessary that the clinical examination precede the X-ray examination as in ulcus ventriculi.

Simple Ulcer of the Stomach.—In 1906 *Hemmeter* reported cases of simple ulcer diagnosticated skiagraphically by the bismuth sticking to the eroded surface after the entire bismuth meal had left the stomach. Since then *Jonas, Jolasse, Holzknecht, Haudek, Graedel, Faulhaber, von Bergmann, Rieder* in Germany; *Pfahler, Cole, Jaches, T. S. Hirsch, Skinner* in this country, have contributed greatly to the diagnosis of ulcer by means of the X-ray.

Based upon the work of those mentioned, and some of our own experience, we will try to study the ulcer by means of the X-ray according to the kind of ulcer, seat of same and whether complicated.

In simple ulcer, *Jonas* called attention to the fact that we can locate the seat of an ulcer by pressing the stomach while the patient is being fluoroscoped, and at the point where the patient complains of pain. It is essential that the seat of pain should change on deep inspiration with the change of the position of the stomach.

More exact methods is the determination of the motility of the stomach, by the time the stomach empties itself. According to *Holzknecht*, whenever an ulcer is associated with hyperacidity, it matters not whether the ulcer is at the pylorus or a distance from the pylorus —there is a delay in motility by virtue of pylorospasm. *Rieder* and *Faulhaber* take exception to that view. They believe, and this coincides with our own experience, that motility disturbance on account of pylorospasm speaks for an ulcer near the pylorus, unless there is

an associated atony of the stomach, in which case we would have motility disturbance independent of the seat of the ulcer.

Simple ulcers near the cardia give the picture of cardiospasm (Fig. 28, p. 291).

Its rare seat at the greater curvature or posterior wall is so far inaccessible to X-ray diagnosis.

Ulcus Callosum (chronic small-cell infiltration around the edges of the ulcer).—This form of ulcer is fortunately most commonly situated at the lesser curvature, hence accessible to X-ray diagnosis.

FIG. 36.—Carcinoma of the Greater Curvature.

FIG. 37.—Ulcus Callosum of Small Curvature.

Haudek called attention to the niche (*Nische*) symptom characteristic of that form of ulcer. It shows a spot of bismuth on the lesser curvature which empties itself when the stomach is empty.

If situated at the pylorus, it interferes with the emptying of the stomach.

Penetrating Ulcer.—These ulcers (see Figs. 8, 9) are characterized by separate sacks of bismuth with their own air-bag (*Magenblase*) on top. In the classical article by *Holzknecht*,* rules for

* Jahreskurse f. ärtzliche Fortbildung, Aug., 1911.

diagnosis of ulcer are so masterfully laid down that we deem it appropriate to describe them in full:

Based upon the fact that, whenever there is an ulcus ventriculi, there is also a slow emptying of the stomach due to hyperacidity and spasm at the pylorus, and also the sensitive pressure point changeable with the position of the stomach either by massaging with the hand while fluoroscoping or making the patient retract his abdomen while fluoroscoping, the following rule was laid down: (1) small rest after

FIG. 38.—Penetrating Ulcer.

FIG. 39.—Penetrating Ulcer.

6 hours, (2) sensitive pressure point changing with the motility of the stomach, (3) no morphological changes: conclusion—simple ulcus ventriculi.

Holzknecht and *Handell* have shown that, where there is antiperistalsis or where the pars pylorica lies to the left, or where there is a snail-form of the small curvature, retraction of the small curvature, stretching transversely of the greater curvature, the "niche-form": all these indicate different stages of ulcus and different complications. Based upon the above-mentioned signs, the following rules were laid down by *Holzknecht:* (1) small rest after 6 hours, (2) accompanying sensitive pressure point, (3) pars pylorica situated high and to the left, (4) snail-form of the lesser curvature: conclusion—old contracted ulcus on the lesser curvature at pars pylorica.

Another rule: (1) small rest after 6 hours, (2) accompanying pressure point at pars media with a sense of resistance, (3) pars

media transversely, (4) "niche-form" without air chamber: conclusion—callous ulcus at the lesser curvature, pars media.

Another rule: (1) considerable rest after 6 hours, (2) size markedly increased: conclusion—stenosis due to ulcus.

Another rule: (1) considerable rest after 6 hours, (2) defect in filling: conclusion—carcinoma on ulcus basis without stenosis.

Another rule: (1) no rest after 6 hours, (2) defect in filling, (3) greater curvature stretched transversely: conclusion—carcinoma on an ulcus basis without stenosis.

Another rule: (1) stomach empty after 6 hours, (2) bismuth in splenic flexure, (3) stomach shorter with stasis at the cardia: conclusion—carcinoma at the pars cardiaca.

Another rule: (1) stomach empty after 6 hours, (2) bismuth in colon ascendens, (3) morphologically normal, (4) sensitive pressure point movable with the duodenum: conclusion—ulcus duodeni.

For small erosions of the stomach, *Hemmeter* and others have utilized the fact that bismuth will stick to eroded surfaces. They gave the patient a bismuth milk and it was found that in case of erosion bismuth would stick to the erosion from 12 to 24 hours.

HOUR-GLASS CONTRACTION OF THE STOMACH

In hour-glass contraction of the stomach we should differentiate "X-ray hour-glass" contraction; persistent hour-glass contraction due

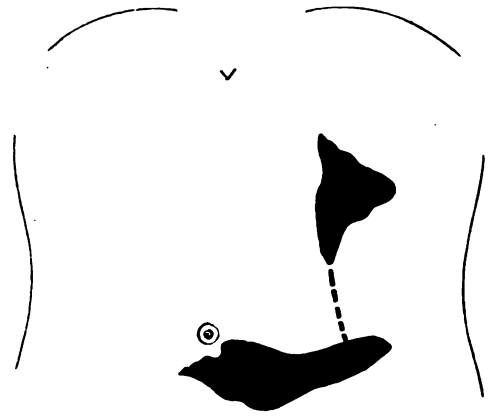


FIG. 40.—Hour-glass Contraction of the Stomach.

FIG. 41.—Carcinoma, Large Curvature.

FIG. 42.—Carcinoma, Small Curvature.

FIG. 43.—"X-Ray"-Hour-glass Contraction.

FIG. 44.—Carcinoma of Pylorus.

to fibrous tissue formation dividing the stomach into two distinct sacs (see Fig. 40); spastic hour-glass contraction; and depressions on the greater curvature by tumors or gas in the splenic flexure simulating an hour-glass stomach; and carcinoma of the greater curvature simulating hour-glass contraction (see Fig. 41).

The so-called "X-ray" hour-glass contraction of the stomach is the result of a deep florid ulcer situated at the lesser curvature. The meal passing the ulcerated area causes a contraction of the circular muscle fibres of the stomach, bringing about an indentation of the

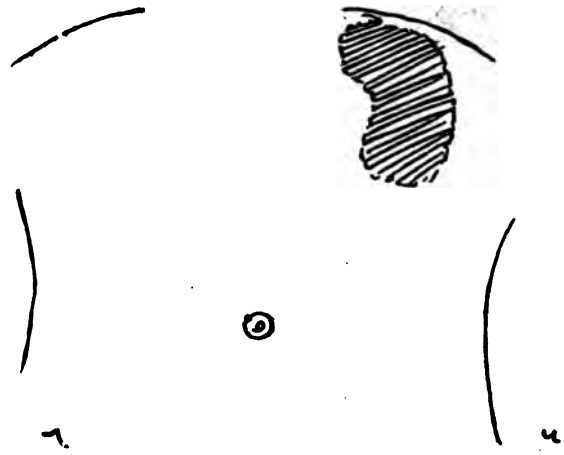


FIG. 45.—Kidney-Shaped Stomach.

greater curvature of the stomach (see Fig. 43, X-ray hour-glass stomach).

Watching such a patient take his meal fluoroscopically, we observe the following: The first few spoonfuls slide directly down to the lower sac, at the same time causing the above-described contraction of the curvature so that the rest of the food gathers in the upper sac. This contraction may last from a few seconds to one-half hour; then the stomach relaxes again. This is the reason why such a contraction is not found on the operating table, because under narcosis, and empty stomach, there is no contraction.

Under rare circumstances the longitudinal fibres contract, with the ulcer on the lesser curvature, drawing the pylorus and cardia nearer to each other and the entire stomach upward and to the left. *Schmieden* and *Haertel* have termed such a stomach "tobacco pouch stomach." *Holzknecht* calls it snake form.

A case observed by us and confirmed on the operating table (*Leo Buerger*) had the form of a kidney-shaped stomach (see Fig. 45, Kidney-shaped stomach). An hour later the contraction relaxes and the stomach adopts its normal shape.

The persistent hour-glass contraction shows skiagraphically 2 distinct sacs separated by a narrow canal.

Jolasse, Rosenfeld, Jonas and *Holzknecht* conclusively proved the existence of an hour-glass contraction by first giving the patient bismuth milk, then introducing the stomach tube and watching the progress of the tube in the stomach. If the tube folds up and deviates to the left, it is considered as characteristic of hour-glass contraction.

Spastic hour-glass contraction: In neurotics with spastic tendencies an hour-glass contraction may result, but relaxation occurs after the administration of atropin sulph., 0.0005 to 0.001 subcutaneously. The hour-glass contraction caused by tumors from without is chiefly characterized by the displacement of the stomach to the other side, and in order to make a diagnosis we must look at the stomach with the patient in a different position, so that the location of the tumor changes and thereby not exercising any pressure on the stomach.

Perigastritic inflammation may simulate hour-glass contraction.

Franz Groedel cites a case, with demonstration of a photograph, where *Rieder's* meal distinctly shows two parts: one about the middle of the greater curvature and the second at the antrum pylori.

Massaging did not influence the condition. Half an hour later the same stomach was found completely filled and of normal shape. *Groedel* explains this as follows: the perigastric adhesion does not allow the part of the stomach involved in the adhesion to yield to food as rapidly as the other part of the stomach. Carcinoma at the greater curvature simulating hour-glass is differentiated by the ragged appearance of the involved part of the stomach due to a defect of filling.

Haudek also succeeded in differentiating an hour-glass contraction

due to ulcer from one due to carcinoma. The former is characterized by a transverse stretching of the stomach and the constriction is chiefly at the lesser curvature; the latter lies longitudinally, the constriction being mostly on the greater curvature; both walls are usually irregular (see Fig. 42).

For larger sized tumors of the stomach region the X-ray is only important to determine whether or not the tumor belongs to the stomach proper, which is proven by giving *Rieder's* meal: if the tumor belongs to the stomach, it will be found that a part of the stomach-shadow is missing.

Pyloric obstruction is characterized skiagraphically by marked peristaltic waves.

Adhesions between stomach and liver shows the stomach transversely situated and pulled to the right with absence of the cap and diminished peristalsis.

X-RAY EXAMINATION OF THE INTESTINES

The topographical aspect of the small intestines is made out with great difficulty. The hardest part of all is the duodenum, of which normally only the pars horizontalis superior is seen. The descending and the inferior horizontal part is only seen in cases of adhesions or where the pylorus is insufficient. The pars horizontalis superior is seen as a half-moon above the pylorus, and the more the duodenum is situated to the right, the longer is the shadow; the width is always the same, 2 to 3 cm.

The reason that the descending portion and the pars horizontalis inferior are not seen is because they are covered by the pancreas and stomach; probably the food goes through too quickly to be seen.

Stenosis of the Duodenum.—This affection was pointed out by *Holzknecht* to be characterized by the pylorus being insufficient, open, and pulled down; under normal conditions only the pars superior horizontalis is seen in the duodenum, and at no time are there contractions visible; but in cases of stenosis we get the entire duodenum filled and visible peristalsis.

Ulcus Duodeni (*Haudek*).—Autopsy findings have established the

fact that whenever the symptoms of ulcer of the stomach were associated with hypermotility of the stomach during life, the ulcer was usually found at the duodenum. *Haudek* diagnosticates duodenal ulcer wherever the symptoms of ulcer of the stomach are associated with hypermotility.

Pyloric insufficiency of a high degree is recognized by dilatation of the bulbus duodeni.

The course of the rest of the small intestines soon after a meal is seen only in a few bismuth spots in the hypogastrium; later larger masses, resembling cauliflower, are seen. In the majority of cases we see only individual curls corresponding to the small intestine. The reason why the small intestine is not seen distinctly and the position cannot be made out, is probably because the bismuth displaces them from the normal position.

With the *Gross* intestinal tube, where we succeed in getting in 250 cm, filled with bismuth, the small intestine may be more properly outlined. Still better is the insufflation of the small intestine with oxygen by means of the same tube.

As to stenosis of the small intestine, *Novak* showed that the existence of small helminthiform masses in the region of the small intestine indicates stenosis. Normally, no wormlike peristalsis can be seen, but a thickly feeling mass between two small constricted portions in the region of the small intestine is seen in cases of stenosis in that location.

Colon.—The position of the colon is best studied by the bismuth bolus enema. For the functional test of the intestines the use of the *Rieder* meal and watching the progress of the meal through the entire intestines is more satisfactory.

The distention of the colon by air is troublesome to the patient and gives a blurred picture. The colon is usually recognized by the haustra; the cecum cannot be separated from the colon ascendens.

The flexuræ are recognized by the adjacent air-chamber; the right is lower than the left.

The colon transversum does not run horizontally, but runs in a line with the greater curvature of the stomach. The haustra are especially well marked in the transverse colon.

From the splenic flexure the descending colon takes a straight downward course, narrowing slightly at the sigmoid, the position

FIG. 46.—Normal Colon.

FIG. 47.—Normal Colon.
Both bismuth given from below.

of the latter being lightly changeable. The entire colon, especially the transverse, is very movable.

FIG. 48.—Colon Eight Hours After a Meal by Mouth. With rest in stomach.

The passage of the food throughout the intestine is as follows: The small intestines are seen from ½ hour after the meal is taken

FIG. 49.—Colon Twenty-four Hours After Bismuth Meal.

up to 3 to 5 hours. Cecum and colon ascendens are seen for fully 4 to 6 hours after the meal; the transverse colon, 10 to 12 hours; the colon descendens for 18 hours; at the ampulla recti for 24 hours.

These figures hold good in a great majority of cases, so that at present, according to many authors, we are dealing with slow motility

FIG. 50.—Twenty-five Hours After Meal, Ascending Colon and Transverse Colon Filled.

if after twice 24 hours there is still bismuth in the cecum or ascending colon.

FIG. 51.—Fifty-five Hours After Meal, Colon Descendens Filled.

Other Parts of the Small Intestine.—Pathological conditions of other portions of the small intestine have not been made out with certainty.

A disturbance of motility in the small intestine is judged by the length of time the bismuth remains in the small intestine.

Colon.—For the proper understanding of the pathological motility of the colon, it is important to point out first the physiological function, first studied by *Cannon* on cats, later on human beings, and then confirmed by a great many clinicians. In the proximal part of the colon—cecum and colon ascendens—there is antiperistalsis or anastalsis, working upon the semisolid contents. This process takes place partially also in the first portion of the transverse colon;

Fig. 52.—Tumor of Transverse Colon.

then, as the contents move farther, they are seen to go down with one motion into the ampulla recti, where there is a grasplike contraction shoving the contents farther down.

Pathologically, there may be impairment of anastalsis at the proximal portion, and sometimes in cases of constipation, remnants of bismuth are seen in that part of the colon 10 to 12 days after the bismuth was given, while the other part of the colon is empty.

It was shown by *Cannon* that anastalsis is also impaired by disturbances in the distal part of the colon, either by spasms or by atonic conditions.

Clinically it is significant that, when the call for moving the bowels is not answered soon, it reflexly works on the anastalsis. The same holds good also of anal fissures, etc., causing spasms.

To differentiate whether a constriction is due to spasticity or adhesions, the bismuth-bolus alba enema usually clears up the diagnosis. Spastic conditions are usually overcome by the enema.

Fig. 53.—Ptosis, V-Shaped Colon.

In occlusion of the colon of whatever cause, the enema will only come up to that portion where the occlusion is. Where a tumor (Fig. 52) causes stenosis, we see marked dilatation above the stenosis and a thin line of bismuth corresponding to the stenotic part of the colon.

Fig. 54.—Ptosis of the Colon Transversum.

This picture never changes on repeated examination.

Complete filling of the colon shows that the tumor is outside of the intestine.

Appendicular fecal stones have been observed by *Weissflog* and *Goldman*. One must exclude here phleboliths, stones in the ureter and mesenteric glands.

Constipation.—Constipation can be skiagraphically demonstrated to consist of four types:

First type: Atonic or ascending type of constipation (*Stierlin*), where the bismuth reaches the cecum within 3½ to 5 hours (normal), but then it remains in the cecum and ascending colon for 20 hours and longer. We see in these cases the cecum and ascending colon very markedly distended.

Second type: Hypocynetic type (*Schwartz*), is where the transverse colon is markedly ptosed, forming a loop or V-shape. In these cases the furthering of the stools is retarded in the entire colon (see Figs. 53, 54).

Third type: Hypercynetic (*Holzknecht, Singer*), spastic type. There is a hyperthony of the lower part of the colon and a normal or hypothony of the upper part of the colon. We find usually the sigmoid and descending colon narrower and contracted.

Fourth type: (*Herz*) dyschisia, where we find in the sigmoid and the rectum the feces retained an unusual length of time, while the other portions of the colon empty normally.

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